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CLIENT COMPUTING

Centralizing computing resources can improve security, speed application availability and reduce support costs.

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CLIENT COMPUTING REFERENCE GUIDE

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Client Computing Comes of Age

Many benefits accrue by managing applications from a central location.

Client computing is a robust technology that helps IT managers manage their desktop fleets more efficiently and supports greater productivity for their organizations. In short, this technology replaces expensive desktop PCs with more modest end-user devices that draw strength from centralized processing power, applications and data that's available for end users anytime and anywhere.

It's a battle-tested approach to computing that dates back to the mainframe era, but with important updates that take advantage of today's leading technology innovations, including virtualization, cloud computing, smartphones and tablets.

Like many game-changing technologies, the strength of client computing lies in its simplicity. This technology's building blocks consist of three main essentials. The first piece is centralized computing resources.

In the past, this meant mainframes. Today, client computing consists of large, highly efficient data centers or private and public clouds that offer scalable computing power and storage resources that can be provisioned on the fly. The second piece is a high-speed wired or wireless network optimized to keep data throughput latencies low and service quality high.

The final piece is the clients, which run the gamut of hardware available today, from desktop PCs to a wide variety of modern thin clients, including those without onboard CPUs or hard disks. Increasingly, the list of devices also includes the latest tablet PCs and smartphones. Client computing lets each organization's requirements and the personal preferences of individual end users guide what hardware works best in each situation.

IT managers are gravitating toward this strategy. Market research firm IDC predicts that shipments of hardware for client virtualization could rise from about 13 million in 2011 to 34 million by 2014.

Similarly, CDW's 2010 *Client Virtualization Straw Poll* found that 90 percent of medium- and large-size organizations are considering or implementing at least one form of client virtualization, with the vast majority of that group planning to install a client virtualization solution within the next 12 to 24 months.

That's the big picture. But, as with any large-scale IT endeavor, the success of client computing depends on a number of factors. They include designing the right architecture; making wise choices about devices, operating systems and applications; and managing the rollout and ongoing operation of the infrastructure. Setting up and running a client computing environment is getting easier all the time thanks to maturing technologies and a host of well-documented best practices.

The Evolutionary Path

Each generation of client computing has been marked by a shift in which organizations concentrate processing power. In the mainframe era, processing occurred in data centers that housed these "big iron" machines.

Later, when desktop PCs proliferated, end users crunched data locally using their own CPUs and information stored on internal hard drives. Today, the pendulum is swinging back to centralized processing resources, either in central data centers or public and private clouds.

For many CIOs, the concept of client computing may seem suspiciously familiar. However, what is new is how client computing mixes the best of this technology's past offerings with today's innovations in ways that give organizations more choice, economy and efficiency for delivering IT resources.

In the past, dumb terminals served a specific purpose, giving multiple users within an organization individual on-ramps to expensive mainframe computing power. Access to mainframe data was a precious resource, and terminals made it possible for both administrative and technical staff to share time on the system.

IT management problems weren't unheard of, but they were well contained because IT did not yet have the challenges of securing and maintaining the scores of PCs that eventually arrived on users' desks. The aptly named dumb terminals, rather than housing any local processing or storage, drew their computing power from their mainframe hosts.

Organizations eventually came to see the limits of this setup, but many IT departments noted the benefits of a closely controlled environment of centralized computing resources, and this approach to computing would resurface.

Fast-forward to today: Computing environments are anything but controlled. Even the days of proliferating PCs seem like a simpler time as CIOs now find themselves managing desktop systems and increasing numbers of rogue mobile devices and tablets. There's a lot of choice and diversity to manage, not to mention security patches, software updates, service tickets and refresh strategies.

Client computing seeks to offer the best of old-school centralized computing and new-school innovation, with the ultimate goal of balancing affordability, manageability and better computing environments. Some far-reaching and complementary technology trends are making this a reality.

Server virtualization is a natural fit for client computing because it lets IT managers extend their goal of shared IT services, allowing clients of all types to tap into back-end servers for processing power, data and applications. End users get the resources they need for their individual requirements, while IT managers centralize management control, allocate resources as needs change and limit the hardware footprint for greater security and cost savings.

Virtualization is now extending these principles further out to end users. Client virtualization, primarily virtual desktop infrastructure (VDI), is becoming a foundation for many new client computing implementations.

Real-world Benefits

Fat clients, thin clients, zero clients — the specific devices deployed aren't of overriding importance unless organizations see clear-cut benefits from rethinking how they deliver IT services to end users. For client computing, there's a lot to like for both IT administrators and end users, including the following five benefits.

Security: Fat clients may have ushered in a new world of computing flexibility, but it came with many drawbacks. Security management became a full-time job at many organizations, requiring staff to physically travel to each PC and install the right software. Security policies for desktops also rely on extensive training for end users and a constantly evolving security infrastructure to manage access to networks and applications.

In contrast, a client-computing strategy concentrates security efforts on a smaller and more manageable number of data center servers. This centralized approach eases the auditing burdens associated with regulatory compliance. Finally, client computing extends an organization's security practices to mobile users, no matter where or when they tap into IT resources.

Centralized management: By centralizing computing power, data and applications in core data centers, organizations reduce the burdens of maintaining and supporting a diverse PC environment. For example, when a new edition of a software application arrives, the IT staff updates only a few data center servers, not every PC in the organization.

It's the same with data backups. IT administrators only need to worry about a manageable number of file servers and networked storage systems, not scores of local hard drives.

Application availability: Centralized management is also an important factor in keeping users connected to important applications. If an end user's desktop PC crashes, work comes to a halt until someone fixes the problem or installs a replacement unit. Not so with client computing.

Clients typically have fewer moving parts, so there are fewer opportunities for failure. But if a device does go down, the user merely needs to log in using alternative hardware to immediately access all the data, applications and power as before. Downtime may be reduced to minutes rather than the hours or days of traditional environments.

The IT staff saves time by maintaining all desktops from a single location. This also helps IT keep better track of regulatory compliance and licensing. Rather than managing endpoints individually, the IT staff can manage them all together from a centralized location.

Dynamic provisioning: Because of lag times for provisioning new equipment, getting all the computing power and applications to end users can be a challenge in a traditional PC environment. And what if individuals need the additional computing power only at certain times of the year, at the end of the fiscal year, for example?

The only way to dial back power is to swap out the entire PC. Client computing offers a much more flexible alternative: The IT department connects clients to pools of virtual servers and regulates the amount of processing power available to each end user with a few clicks in a resource-management program.

Lower costs: Client computing offers organizations lower support costs, more efficient allocation of IT expertise, and increased productivity from highly available applications and infrastructures. Organizations also save when they don't have to replace client hardware as often to take advantage of the latest innovations. Some organizations enjoy an additional cost benefit: Thin clients draw less power than traditional PCs, which can be a hedge against higher energy prices.

Innovation Continues

Client computing has come a long way from the days of dumb terminals, and that innovation isn't showing any signs of slowing down as new thin clients, virtualized servers and desktops, and cloud services continue to enter the market.

Some of the biggest changes may come from the growth in mobile computing. In the short run, client computing offers a way for organizations to address the "consumerization" of IT, a trend in which individuals use smartphones and tablets as both personal and professional devices.

Without close management by IT staff, these devices represent a threat to security practices already in place. The centralized management and administration that are the hallmarks of client computing may be the best way to balance end-user preferences and the organization's IT policies.

Longer term, client computing may promote what some analysts are calling "user virtualization," where the type of end-user device in use doesn't matter. Instead, work environments will have all the tools necessary to handle any mix of hardware, operating systems and applications. Individuals will be able to move easily throughout the day from a desktop PC to a thin client or smartphone, depending on which tool works best at any particular time.

This potential illustrates what may be the most important characteristic of client computing: It frees organizations from inflexible infrastructures and IT strategies. Depending on the needs of the organization as a whole, or of each individual user, client computing delivers the right IT resources at the right time to everyone who needs them. ■

GAUGING ROI

On paper, client computing offers many opportunities for greater efficiency, higher productivity and cost savings. However, performing a traditional return-on-investment analysis and arriving at hard numbers isn't easy. Part of the challenge is that client computing offers a mix of tangible and intangible benefits that are hard to quantify, yet nevertheless deliver value to organizations.

One point is clear: IT managers understand why client computing is an important investment. For example, 60 percent of the respondents in CDW's recent *Client Virtualization Straw Poll* say they have invested in or are considering client virtualization to reduce their hardware footprint and cut support and management costs. The IT professionals in the survey who researched ROI estimate that client virtualization can save more than 20 percent of their IT budgets.

To measure their actual savings, organizations should key in on several important areas, compiling numbers that compare the costs of client computing versus traditional desktop strategies regarding the following: power consumption, help desk and tech support costs, IT administration, security management and application uptime.

Comparisons such as these can reveal some impressive numbers. For example, one large organization recently reported a $2.4 million reduction in desktop maintenance costs and an $800,000 cut in energy expenses, all from swapping thin clients for traditional PCs.

One caveat: Some upfront restructuring and new investments in server, network and storage infrastructure may be necessary to accommodate a large-scale client computing implementation. Before an organization makes the move, it needs to carefully assess its existing environment and factor in any ancillary investments as part of its ROI calculations.

Client Computing Architectures

Understand the available options before moving forward.

Client computing is all about right-sizing: matching streamlined yet powerful hardware with lightweight, remote application software that gives users the specific resources they need to do their work. However, there are trade-offs to this approach. For example, not every user can run every conceivable application at any given time with thin clients or zero clients.

An organization that depends on traditional desktop PCs runs the risk that it will overprovision computing resources (which also explains why industry analysts say most hardware runs at only a fraction of its rated capacity). The client computing alternative avoids these unnecessary costs by reducing management overhead, bolstering security and creating dynamic computing infrastructures that can easily adapt to quickly changing requirements.

For organizations to succeed with client computing, IT managers must understand the various architectural options available to them, the pros and cons of each and how to make the best choice. A one-size-fits-all solution really doesn't exist.

In fact, some organizations may find they need an architectural mix to assure the right fit for each department, workgroup or individual. Understanding the architectural landscape is important for another reason: It gives IT managers a clearer picture of how client computing can coexist with other important IT strategies, such as virtualization and cloud computing.

Architecture Options

Much of what determines the success or failure of client computing hinges on what happens behind the scenes in the infrastructure responsible for delivering IT resources to users. That's where an organization's applications and data reside and where the network pipelines keep applications and data flowing among desktop clients and servers.

Client computing architectures fall into five main categories and are broadly characterized by where the actual processing takes place: on the servers or on the clients themselves. Solutions may also be characterized as having persistent or nonpersistent desktops.

Persistent desktops are custom environments that are created and stored for each user. Whenever an individual signs in to the server, he or she sees a familiar home screen and assortment of applications. Nonpersistent desktops don't maintain any individual settings, just a menu of applications made available by IT administrators.

The five architectural categories are presented here in order of sophistication and chronology, in terms of when they appeared on the market.

Presentation Virtualization

Presentation virtualization relies on data center servers to centrally store and run applications and operating systems. All the program execution and data creation performed by users takes place on the servers. So rather than using a full version of a software application on a local system, users download what's known as the presentation layer of a program, which consists of the screen images and menus needed for the task at hand.

Using a keyboard and a mouse, users enter commands that flow back to the host servers, where the real processing action takes place. This means that end users need only a bare minimum of hardware on their desktops — essentially a display, keyboard and mouse — and can forego more expensive devices with CPUs, memory and hard disks.

Presentation virtualization offers a number of benefits for both IT managers and end users. First, it's a highly secure approach that benefits from centrally managed access controls and patching policies administered by data center personnel.

It's also more efficient because applications are managed and updated centrally to assure that end users are working with the latest versions. And when combined with secure WAN and Internet connections, presentation virtualization frameworks let users work on the road or from home offices and still access the same applications and data that are available in their office environment.

However, not every presentation virtualization option can tolerate network disruptions. If the network connection goes down, client devices and servers may no longer exchange information, which could bring end-user work to a standstill.

Application Virtualization

Much like presentation virtualization, application virtualization displays only the screen images of applications on local client hardware. The programs themselves reside on central servers and wait for end users to relay instructions via inputs and mouse clicks transferred over the network.

Application virtualization differs in that it can separate applications from operating systems, delivering entire programs to client devices. This is an important advantage that overcomes the productivity problems that occur with network breakdowns. If a connection is severed, end users can continue to work locally and then send updates to the central servers when communication links are re-established.

Another benefit is that end users aren't tied to specific operating environments. Because application virtualization isolates programs from operating systems, a client device set up for Microsoft Windows, for example, can also run an application written for the Mac OS.

In the past, application virtualization solutions displayed entire virtual desktops on client machines. Today, some of the newest versions separate desktops and applications so end users only need to download the programs they require at any particular time.

Depending on the specific manufacturer and product, the performance and resolution capabilities of an application virtualization solution could be guided by a variety of standards, including Independent Computing Architecture (ICA) or Remote Desktop Protocol (RDP).

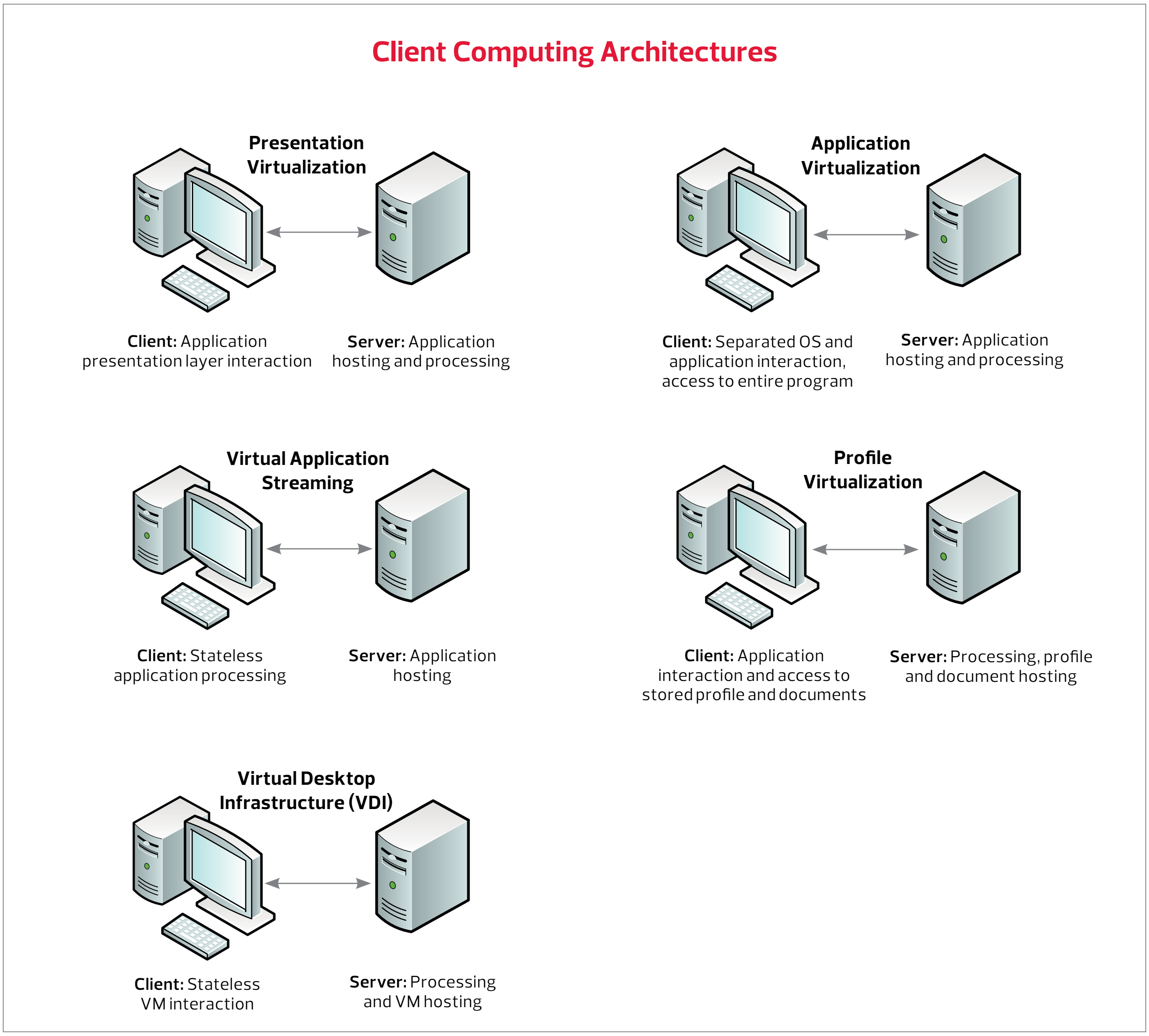
Application virtualization is a productive option for workgroups or departments where staff all run the same applications. Everyone has access to the software and capabilities they need, while the organization is spared having to purchase and maintain redundant copies.

Virtual Application Streaming

Virtual application streaming is the flip side to presentation virtualization. With this alternative, data center servers still host full versions of applications. But instead of sending mere screen images to local clients, the servers send actual data and portions of the program to the desktop.

This is an important distinction from presentation virtualization because it means data manipulation and processing takes place on the local client computer. This gives end users the ability to work even if they're disconnected from the network. Any changes made during this offline mode are then sent back automatically to the central hosts when the network connection is re-established.

Although portions of the application reside on the client devices, this is



only temporary, unlike traditional or "stateful" environments in which each PC maintains full copies of programs. This so-called "stateless" characteristic of virtual application streaming means that all the programs and data are saved to data center servers, and the client hardware is wiped clean when users shut down at the end of the day.

From a hardware perspective, virtual application streaming requires more powerful clients than host client virtualization solutions, with fast CPUs and local memory to go along with the display and input components.

Profile Virtualization

Profile virtualization uses the overarching client computing principle of centralizing IT resources and delivering them as needed to client devices via a network connection. This technology offers the ability to distinguish each user's personal profile data from the documents they've created and then store that profile information centrally. This can be important for quickly getting back to work when moving to new client hardware.

Virtual Desktop Infrastructure

VDI (also known as desktop virtualization) takes a page from server virtualization by separating operating systems and applications from hardware to create virtual machines, or VMs.

IT administrators can create a custom-tailored VM for each user that includes the right combination

FIVE DRIVERS FOR VDI

Virtual desktop infrastructure (VDI) is more than just the latest and greatest technology to hit the data center. It's gaining momentum because it gives organizations a number of cost, manageability and reliability benefits. Even better, organizations can achieve these goals without compromising end-user performance and productivity. VDI can help organizations achieve several goals including the following:

Keep a lid on costs. VDI can reduce capital expenses by offering an alternative to PC hardware refreshes that typically occur every three to four years. Fully equipped PCs will always be important for end users who need access to local processors and applications.

However, a growing number of users may be better served by low-cost clients with modest or no CPUs or hard drives. The main role of these clients is to pull data and applications from server hosts — a process that requires much less computing power. Thin clients also don't have to be replaced as frequently; in some cases refresh cycle are six to eight years. And if one breaks down, they are easy and inexpensive to replace.

Rethink hardware acquisitions. Some organizations see the potential for additional hardware savings by letting staffers bring their own notebooks, tablets and netbooks to work. Organizations can use this strategy safely because all the work necessary for securing and managing applications happens within the protection of the data center or cloud.

Manage IT complexity. It takes several dozen IT support technicians for a large enterprise to manage a traditional PC environment. According to the tech research firm Forrester, one rule of thumb is to allocate one technician for every 60 PCs. The reason? It takes a lot of time to move from desktop to desktop to address hardware problems, install new applications and load the latest security patch.

Not so with VDI clients, which benefit from centralized IT resources. By freeing the IT staff from making frequent visits, support costs may be cut in half. That means IT technicians can oversee many more devices — as many as 175 thin clients per support technician, according to Forrester. One organization analyzed by Forrester estimated that VDI reduced help desk calls by 40 percent.

Secure applications and data more efficiently. Running applications from the data center with the help of VDI can bolster security strategies and mitigate many of the risks associated with having PCs on every desktop. In addition to implementing security policies centrally from the data center, IT managers can establish clear audit trails tracking who's accessing files and when they're being edited (which also eases regulatory reporting).

Reduce downtime. IT managers can use tools in the data center to deliver additional processing power, memory or storage capacity to end users as requirements change, without disrupting the workflow. It's a major step forward compared with traditional PC environments, where hardware must be shut down while technicians upgrade processing power, memory or storage resources.

of operating system and standard productivity software, such as Microsoft Office. In addition, the VM also includes any personal settings, ranging from contact lists in e-mail programs down to the style and color of the on-screen wallpaper.

Client hardware is stateless. Once end users are done for the day, the VM and any work performed returns to the safety of the data center servers and networked storage systems.

Industry-standard encryption and compression technologies keep communications between desktops and data centers flowing securely and efficiently. VDI keeps VMs walled off from one another. So infections won't spread from one environment to the next, and unauthorized individuals can't access privileged information.

From an end user's perspective, the computing environment doesn't look or behave much differently than it does on a full-featured and personally dedicated PC. But there are some differences.

VMs can run on a wide variety of client computing hardware, including full-size desktop PCs. However, this amount of processing power is overkill for most implementations. Thin clients are a better option; with their smaller appetite for power and fewer moving parts, thin clients are less prone to failure and require fewer upgrades.

Users don't have to be tied to their desks to access important resources. They can tap into their personal VM wherever there's a secure network connection to the central data center. And because the VM is server-based, IT managers can maintain and secure the software and data from a central location.

VDI may grow in importance as tablet PCs and smartphones become more prevalent. It's now possible for mobile users to run their VMs on these devices and take advantage of a full operating system experience, limited only by the physical constraints of portable keypads and displays.

Client Computing and Virtualization

The various architectural options IT organizations can choose from for client computing mesh well with other efficiency and consolidation initiatives taking place in many data centers. One example is server virtualization, which consolidates hardware, better utilizes processing capabilities and reduces overall energy costs.

The improvements necessary to support a wide-scale server virtualization project, such as upgraded network bandwidth and migrating data from disk drives attached to desktop PCs and file servers to storage area networks (SANs) and network-attached storage (NAS) systems, would play an important role in implementing VDI, which relies on efficient communications between end-user client hardware and central servers. Networked storage is also essential for thin clients that lack their own onboard disk drives.

In turn, many of the same drivers that encourage server virtualization apply to client virtualization. For example, IT managers can pack high-performance servers with scores of individual VMs created for client computing environments.

This drives up the utilization rates of physical servers and reduces the amount of time their high-end processors sit idle. The VMs created for client virtualization also let the IT staff quickly provision new bundles of applications and operating systems; so new hires get the resources they need and workgroups can be created on the fly.

Client Computing Meets the Cloud

Client computing is also a natural complement to an organization's cloud initiatives, whether that's a private implementation inside the firewall or a public service provided by a third-party source. Some of the leading drivers for cloud computing include the ability to dynamically provision IT resources, budget for services at predetermined rates rather than hard-to-predict capital expenditures and provide better security through centralized controls.

Once clouds are implemented, IT administrators can tap them with client computing hardware to access important applications via a software as a service (SaaS) model. Similarly, modestly outfitted thin clients can get a power boost from infrastructure as a service (IaaS) IT resources.

With these options, end users never have to worry that their thin clients will compromise productivity, even if a new project brings with it the requirement for new capabilities. At the same time, end users won't be plagued by downtime from system crashes, viruses or the installation of component upgrades to their desktop hardware.

Recognizing the natural compatibility of cloud computing and client computing hardware, a number of manufacturers are now designing Cloud PCs. These devices are designed and built under the assumption that the main software components — operating systems, applications and data — will reside in a cloud. Cloud PCs deliver onboard processing power, graphics capabilities and network connections to access software delivered from the cloud, but they typically don't include hard disks for local storage.

The combination of clouds and virtualized desktops are the latest option that organizations have for achieving the overarching goal of client computing. They are an effective way to right-size all the resources end users need to work efficiently and economically. ■

Client Computing Devices

Understanding which device works best for each application yields valuable benefits.

Client computing hardware offers a rich mixture of component options that combine the latest designs, CPU choices and multimedia capabilities to deliver the IT resources that users need. With the right enterprise architectures and operating systems supporting them, client computing hardware can help organizations become more productive and reduce overall IT costs.

As promising as client computing is, there's still a place for traditional fat clients with fast processors and a local operating system and hard drive. The key is to understand the individual strengths of thin, zero and fat clients and then balance the various options to find the right fit for each user.

Thin Clients and Zero Clients

The two main choices for client computing hardware, thin clients and zero clients, offer subtle differences that can help IT administrators meet specific needs. Both options share one trait: They are designed for environments in which IT resources are all stored, managed and maintained in a central location, such as a data center or private or public cloud.

Thin Clients

Traditional thin clients remain the standard for client computing. In their typical form factor, they consist of a compact box the size of a hardcover book or smaller. The unit contains a CPU, varying amounts of standard and flash memory, and an assortment of connectors that let users plug in a monitor and keyboard and connect to LANs and WANs.

Users can attach additional capabilities via USB, serial, parallel or PS/2 ports. What's missing, by design, is a hard-disk drive, which is not needed thanks to the client computing architecture that stores data and applications in a central location on back-end servers. With this architecture, thin clients can be stateless, meaning that when users shut down for the day the devices don't retain applications, data or user profiles.

Thin clients may run slimmed down versions of Linux, Windows or a proprietary operating system embedded in the firmware. Manufacturers of thin client hardware typically include device management tools to help organizations configure and load balance clients and make any updates to the firmware. The tools may also provide Hypertext Transfer Protocol Secure (HTTPS) encryption to secure communication passing from clients to servers.

Beyond the basics, thin clients differ by the types and mix of components that manufacturers pack into the box. For example, for many types of knowledge-based staff applications, such as automation software or specialized call center applications, thin clients come with lightweight and efficient processors in the 1 gigahertz to 2GHz range.

For more specialized applications, especially those with significant high-definition video requirements, thin clients can pack even more impressive power.

Newer models now come with dual-core processors and an onboard vector-graphics engine and HD decoder. Other high-end features include integrated Windows Media Player and Microsoft Internet Explorer, and support for embedded Windows applications.

Mobile thin clients are a variation on the thin client theme. They come in a netbook-like package with an LCD screen and keyboard, but without a hard disk or other moving parts.

The devices also include high-performance, low-energy processors and Gigabit Ethernet network connectivity for full access to data center resources and improved security. Mobile clients give remote users one more advantage: they're lightweight, with some models weighing about 3 pounds.

Zero Clients

Zero clients share many of the design characteristics of conventional thin clients. The main difference is that they lack an embedded operating system. Instead, zero clients pull the entire operating system from their server hosts, along with centrally delivered applications and data. This strategy offers some subtle yet important advantages over a traditional thin client.

First, zero clients dispense with even the modest setup and configuration requirements of other thin clients. The IT staff merely plugs the zero client into a network and users can begin accessing data center resources. And because there's no operating system, the devices don't require any ongoing updates, eliminating the need for traditional IT maintenance.

Zero clients come in different formats, including the typical thin client book format, with inputs for a monitor and keyboard. Other models pack the computing power into a display unit for even fewer individual components. Either way, zero client hardware includes connectors for LANs and WANs.

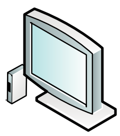
USB ports are available for attaching additional peripherals and graphics accelerators, with some models able to handle high-resolution 3D and HD output. Mobile users have their own zero client option, with all the necessary technical capabilities packed into a USB thumb drive that lets a notebook or netbook connect to servers as a zero client device.

Another common component for zero client systems is PC-over-IP (PCoIP) technology. This maturing compression protocol is designed to improve graphics performance, particularly over WAN connections. It also helps organizations bolster security by natively encrypting data that travels between central data centers and client computers.

An important design innovation of PCoIP is its ability to recognize different types of content and then apply the best form of compression for each type. Some tests have found that zero clients with PCoIP reduce display latency by 50 percent or more in some common user activities, such as scrolling through the pages of a lengthy document.

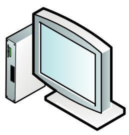
CLIENT COMPUTING HARDWARE OPTIONS

Choosing among client computing hardware options doesn't have to be an all-or-nothing proposition. Many organizations require a mix of different client device forms, depending on the end users' computing focus. Each device has unique qualities.



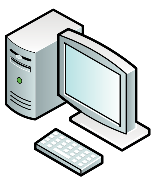
ZERO CLIENT

- Operating system/applications/data delivered by centralized server
- Network connection plug-and-play
- PC-over-IP (PCoIP) compression available
- Minimal IT maintenance needed



THIN CLIENT

- No hard-disk drive/stateless
- Some standard/flash memory
- Embedded operating system/management tools
- Receives applications and data from centralized server



FAT CLIENT

- Heavy processing power
- Mobile computing friendly
- Reduced infrastructure expenses

ENERGY SAVERS

One of the prime advantages of using thin clients instead of full-service desktop PCs is the reduced amount of energy that's required to run the devices. The differences can be dramatic: Thin clients can lower energy consumption by 90 percent for desktop hardware in some cases, according to some industry experts.

A number of rating systems evaluate individual models for energy efficiency and offer a guide when selecting products. The following are two valuable rating labels to look for.

EPEAT: This acronym stands for the Electronic Product Environmental Assessment Tool, an online utility designed to help buyers compare the environmental characteristics of computing equipment. EPEAT is managed by the Green Electronics Council and is based on standards developed by the Institute of Electrical and Electronics Engineers (IEEE).

Organizations can search the EPEAT database of registered products (**www.epeat.net**) by manufacturer and product category. Of the seven categories listed, thin clients represent the largest sample, with more than 1,500 entries.

EPEAT tests rate products on 51 criteria and require each model to meet 23 core benchmarks for baseline certification. Products then receive a Gold, Silver or Bronze rating depending on how many of the additional 28 criteria a product meets. The Green Electronics Council estimates that more than 300 million products now have EPEAT ratings, which the group says equals the environmental impact of removing almost 9 million passenger cars from the road for a year.

Energy Star: This term refers to the older, more familiar efficiency rating issued by the U.S. Environmental Protection Agency. EPEAT makes compliance with Energy Star one of its 23 core criteria. A list of Energy Star–rated thin clients is available at: **downloads.energystar.gov/bi/qplist/thin_clients_prod_list.pdf**.

The Benefits of Thin Client Hardware

Organizations and end users see a wide range of benefits when IT administrators use sleekly engineered thin client and zero client hardware in a client computing architecture.

The most powerful CPUs and latest design innovations aren't needed to keep users working efficiently because the processing demands are handled in the data center, not the desktop. That means organizations can safely choose to use some of the less expensive client devices available and extend their associated refresh cycles to perhaps six years or more.

Thin and zero clients also require less power. Because these units don't have hard drives to fuel or cool, electricity demand is a fraction of what it is for desktop PCs. The lack of internal moving parts also means there are fewer components to break down, which translates into fewer service calls to end-user desktops.

But shaving costs isn't the only reason to consider thin clients. Simpler hardware designs make for easier and faster deployment. After technicians plug the clients into the network, there are no applications to install, programs to configure or incompatibilities to resolve.

Hardware simplicity continues to pay dividends long after the hardware is deployed because the need for patching is rare, and ongoing provisioning of resources happens in the data center rather than at the desktop.

Another advantage is security: It takes far less effort to secure a thin client than a traditional desktop because important data doesn't reside permanently on these stateless devices. The data is safely returned to central storehouses once the client devices shut down. This means that security experts in the data center have complete control over who accesses applications and information, reducing the risk that data will be stolen or lost.

For similar reasons, organizations can run backups more efficiently when resources are centralized on a smaller number of systems compared with hundreds or thousands of individual desktop and notebook units. The same applies to recovery operations if natural or human-caused disasters occur.

Client Caveats

With a long list of potential benefits from client computing, some organizations might conclude that the days of full-size desktop PCs and notebooks are over. After all, why spend the money, dedicate the maintenance resources and grapple with the higher security risks inherent with traditional PCs and portables?

Actually, there are a number of reasons why users still need these devices. The best IT strategy is one that finds the right mix of hardware rather than adopting one technology over another. Thin clients have much to offer, but they present some serious implications to the computing environment that IT managers need to consider, including the following.

End-user performance: Some work just needs a traditional PC or notebook. Graphics-intensive applications, including those used for financial analysis, require the low latencies and high-end number-crunching abilities available from desktop workstations. Similarly, mobile users may need their own self-contained computing environment on the road, especially when meeting with clients or working in the field where network connections aren't reliable.

Thanks to more powerful processors and increasing amounts of memory, the latest tablet PCs and smartphones are creating their own niches within many organizations. Tablets, especially, are replacing traditional notebooks among users who value the connection reliability of having both Wi-Fi and cellular networks, yet aren't constrained by smaller displays and keyboards.

Data center upgrades: Although thin clients are less expensive than traditional desktop devices, some of the total cost shifts to back-end operations. Data center servers are called upon to do the processing, device management and other day-to-day activities that would otherwise take place on the desktop. Depending on each organization's existing resources, that can mean additional investments in server hardware.

Network makeovers: The network infrastructure is another area that requires close scrutiny when evaluating a client computing strategy. Network pipelines are under constant pressure to deliver keyboard and mouse clicks, data and applications between the data center and every active desktop.

All of this requires an infrastructure that's been engineered for normal traffic levels as well as huge spikes, including the 9 a.m. crush when everyone in the organization tries to log in to their virtual desktops.

Data management: Centralized data processing doesn't work effectively without centralized storage management. That could entail upfront expenses for new or expanded storage area network (SAN) and network-attached storage (NAS) systems.

License reviews: Organizations also need to carefully review their operating system licenses to determine whether existing contracts comply with a client computing rollout or whether additional investments are necessary.

Device diversity: With so many new hardware options available today, the choice isn't just among thin, zero and fat clients. A growing number of hybrid devices are finding niches in enterprise environments, including economical all-in-one PCs that offer much of the implementation and maintenance advantages of thin clients, but without the potential additional strains on data center and network infrastructures.

Smartphones and tablet PCs are becoming sophisticated enough for enterprise environments. And with the right security policies in place, these devices maintain communication and access to information in easy-to-carry form factors.

So how do organizations determine where thin clients fit best and avoid organizationwide upheaval? For many, a slow and gradual build out of the client computing environment is best. Then expand the strategy as the benefits materialize and it becomes easier to gauge the ROI.

Good starting points are application areas where thin client hardware has traditionally found success, including internal help desks and public-facing call centers. ■

Client Computing and COOP

Centralized management, easier provisioning and efficient failover support continuity plans.

The latest IT innovations deliver productivity improvements that help organizations run more effectively, cut unnecessary costs and deliver benefits to end users and constituents. Of course, the flip side to relying so heavily on IT infrastructures is that organizations become vulnerable to breakdowns with potentially catastrophic consequences if critical technology systems fail.

The problems may range from the minor inconvenience of users who are temporarily unable to perform their duties to something as severe as the inability to process service requests or serve partners and constituents. In some cases, organizations that suffer extended downtime find the consequences so devastating they are unable to fully recover to their predisruption capacities.

Such threats make it clear to IT managers that a solid continuity of operations (COOP) plan is a must for modern organizations. But ironically, while the plans are important, many organizations struggle with putting their COOP plan into action, especially during periods of tight budgets.

Continuity of Operations: Being Prepared

There are two main reasons why many of these efforts fall short. First, it's easy for budget hawks to view COOP as an expensive insurance policy — a good idea in a perfect world, but one that's hard to justify and fully fund when there are so many other organizational needs.

Second, some of the principles of COOP, specifically the need for redundant IT systems, equipment and data centers, go against efforts to do more with less and squeeze optimum utilization rates out of today's technologies. Backup hardware earmarked for emergencies may sit idle or barely used day in and day out, making it easy for some skeptics to consider these resources the problem and not the solution when it comes to better IT management.

Fortunately, client computing offers a way to implement the protections of a reliable COOP strategy while still achieving the budget and efficiency goals of the organization. Client computing helps attain this balance because it can deliver the resources necessary to power daily operations, while also enabling the dynamic provisioning and failover capabilities required for disaster recovery.

And because client computing maximizes the benefits of desktop and server virtualization, organizations don't have to spend excessively for extra hardware. Instead, IT managers create multiple desktops via VMs that offer the safety of redundancy without many of the upfront costs.

If one thin client breaks down or loses its network connection, an end user can re-establish access to data center resources simply by moving to another thin client, or even a smartphone or tablet.

Client computing can also free organizations from taking unnecessary risks when deciding which systems need to be fully protected against disaster and which systems, though important, are not worth the investment. The combination of centralized management, resources that can be provisioned on the fly and efficient failover options give every system the insurance it needs.

Clear and Present Dangers

Severe IT service disruptions aren't hypothetical fears. In CDW's 2010 *Business Continuity Straw Poll* of IT decision-makers, a full 97 percent of the executives acknowledged that network disruptions had a detrimental effect on their organizations in the past year.

A quarter of respondents said they had experienced a network disruption lasting four hours or more within the past year. And hardware breakdowns, responsible for 29 percent of the outages, ranked near the top of the list of most common failure points.

Other responses revealed what a major breakdown can mean for an organization. Fifty-seven percent of the executives polled identified productivity losses as the top negative effect of their disruptions, which cut staff members off from applications, data and communication systems. In fact, 46 percent said staff could not access the necessary resources to perform their duties.

Other industry studies bolster these findings. The *2011 AT&T Business Continuity Study* surveyed large public sector and commercial organizations. Its findings show that the most common reasons for invoking COOP plans in the last year were extreme weather and power outages at facilities.

Survey participants also identified a host of new continuity concerns. Seventy-eight percent said that the use of mobile devices by staff is bringing about changes in their COOP strategies. And 79 percent of the IT managers said they were concerned about the growing adoption of social networking applications — primarily because of security vulnerabilities.

To guard against these threats, a COOP plan lays out a strategy for maintaining the uptime of essential services as well as procedures for gradually bringing important but less critical systems back online. The best strategies are comprehensive enough to span every contingency, from hardware and software failures to blackouts, hacker attacks, human error and natural disasters, such as earthquakes or floods.

A COOP plan should designate which procedures will be launched for each contingency, as well as who's responsible for what action. The plan should also provide an estimate of how long it will take for each system to return to normal.

COOP Components

A successful COOP plan consists of two main elements that are closely related but represent important niches. The first, continuity of operations, focuses on avoiding shutdowns; for example, detailing how a power generator will automatically kick in if the main electrical supply falters.

In the best situations, users continue working without even a temporary delay. But best case scenarios don't always materialize, which is why COOP also needs to incorporate a second element of preparedness around disaster recovery (DR) strategies.

DR consists of the policies, procedures and systems that an organization will call upon to restore operations in the event of a full shutdown. In modern IT organizations, one of the prime responsibilities of disaster recovery is to protect core data from loss or damage and then quickly make it available again for normal administrative operations.

To successfully adopt COOP and DR strategies, organizations need to make their plan an integral part of IT and administrative operations, rather than layering it on top of these activities. That way, the technology implemented for the plan can be both an insurance policy when disaster strikes, as well as an ongoing resource to assure efficient operations.

How Client Computing Can Improve COOP

Client computing can help organizations execute a COOP plan because many of client computing's main characteristics have direct ties to COOP best practices. The following are five common scenarios identified by industry analysts and manufacturers as highlighting client computing's role in COOP.

COOP Challenge No. 1: A single point of failure brings down larger systems. In traditional IT environments, processing power is concentrated within desktop PCs. If a unit fails, work stops until it is repaired or replaced. Depending on the problem, downtime might last a few hours or, if a new device must be requisitioned, delivered and installed (especially a new server), it could last a few weeks.

Client computing solution: Client computing architectures are designed from the start to support multiple access points. So rather than depending on the health of individual devices, client computing lets end users access data and applications from any authorized hardware component.

This makes thin clients interchangeable. If one crashes, a user merely logs in to a virtual desktop using an alternate device. That's because the real computing power, data and applications are protected in back-end data centers.

To attain this same level of protection in a traditional environment, each end user would need a redundant PC and real-time data mirroring, which is unfeasible for most IT budgets.

Similarly, IT managers can move virtual desktops, data and applications from one physical server to another if one machine shows the early signs of failure. These failover efforts can also scale to jump geographical boundaries.

With replication enabled by virtualization, organizations can move their systems to alternative physical locations if a natural or human-caused disaster brings down a primary site.

COOP Challenge No. 2: An important system isn't fully protected with adequate backup and recovery resources. COOP often depends on having a ready supply of redundant systems able to come online in an emergency.

Redundancy is expensive, so organizations often find themselves trying to gauge the relative

COOP BEST PRACTICES

In addition to using client computing architectures to bolster COOP plans, IT organizations need to implement a number of fundamental best practices to protect their organizations. Here are four useful best practices.

1. **Document everything.** At the top of the list is the meticulous documentation of all aspects of a COOP strategy. Having a clear and updated record of continuity and recovery procedures will help eliminate confusion if a disruption occurs and puts the organization in a position to respond quickly, when timing is everything.

2. **Take inventory.** Conduct an inventory and assess the state of all production systems, including how workflows within and among these systems have evolved over time. This process should also gauge the importance of each system so organizations can prioritize which resources should be protected from ever shutting down, which can survive temporary disruptions and which require attention only after more critical systems return to normal.

   In addition to evaluating the operational importance of each resource, the assessments should consider related factors, such as contractual requirements and regulatory mandates.

3. **Go slow.** Implement COOP in manageable phases. The assessments the organization makes while taking inventory will identify areas that require immediate attention.

   Once COOP is successful in these critical systems, organizations can use the lessons learned to gradually roll out continuity plans to other areas based on their relative importance. This piecemeal approach will minimize disruptions to staff, better target spending where it's needed most and offer a showcase for demonstrating COOP success.

4. **Budget for ongoing training.** In the crush of daily work, it's easy to gloss over COOP training or schedule only intermittent review sessions. Without a clear understanding of policies and procedures, staff members risk delaying important actions when a crisis unfolds. COOP training should be part of the orientation process for new hires and at least an annual exercise for existing staff members.

importance of each application. They then invest accordingly for backup and recovery, depending on whether a program is deemed mission-critical, operationally critical or nonessential.

Client computing solution: Virtualized architectures in data centers require far fewer servers to keep applications up and running. This means only a small number of physical machines are needed to run productivity applications and provide redundancy, which lowers investment costs.

COOP Challenge No. 3: IT complexity delays or impedes replication plans. The one-to-one replication required for a smooth transition from a crippled primary machine to a backup unit is best accomplished when the hardware is essentially identical. However, variations in physical hardware and the individual configurations of components and software complicate replication efforts in traditional environments.

Client computing solution: Virtualization separates software dependencies from the underlying hardware, which means physical devices don't have to be exact duplicates of one another. IT managers can easily move virtual machines among various hardware platforms without encountering incompatibilities and configuration conflicts.

COOP Challenge No. 4: Inadequate testing fails to identify gaps in COOP strategies. A COOP strategy is at risk of breaking down during a crisis if it's not tested regularly and thoroughly. Testing identifies any gaps in the planning processes and warns IT managers if changes in the environment require updates to the original plan.

Most organizations don't have excess hardware resources standing ready for testing activities, and it's too risky to subject production resources to procedures that could lead to unplanned downtime.

Client computing solution: Client computing facilitates dynamic provisioning. This lets organizations create pools of processing power that may be idle throughout the organization to use as virtual test beds. Virtualization's ability to wall off and protect resources running on the same physical machine keeps any problems in the test environment from spilling over into production systems.

COOP Challenge No. 5: Organizations implement inadequate contingencies for working offsite. Natural disasters (such as fires and floods) and other threats could close main offices and make it impossible for staff members to access IT systems.

Client computing solution: With client computing, applications and enterprise data reside in central data centers, failover sites or clouds. This means offsite workers can access their full computing environment over secure network connections from home or from a temporary office location. ■

Client Rollout and Management

Putting a client computing project into action requires planning.

Once all of the research is done to gauge the potential benefits and risks of client computing, it's time for the hands-on work: rolling out the strategy within the organization. During this phase, IT administrators make definitive choices about the best architecture and device combinations for their organization, as well as a careful assessment of the existing IT infrastructure to address any stress points that could hinder the project's success.

Part of the challenge in this phase is managing the diversity of choices that IT managers face. What's the right architecture? What mix of thin, zero or mobile clients fits best into this framework? Will the existing server and network infrastructure fully support the increased demands of centralized IT resources? Or, is there a need for significant new investments?

Once those questions are answered, IT managers can turn to some ongoing maintenance and management issues: What tools and policies are necessary to adequately support client devices and users? And finally, what are the latest management best practices to assure that anticipated long-term benefits aren't short-circuited by policy or technology gaps?

The first step is to resolve the architecture, device and infrastructure questions.

How to Select the Right Architecture

Each of the three primary architecture choices detailed in Chapter 2 (virtual application streaming and profile virtualization being forms of application virtualization) has its pros and cons. Exploring each of these choices is important, because even within the same enterprise different architectures may be right for different workgroups and divisions.

Presentation virtualization: This option is the most mature of the available architectures. It delivers images of server-based applications that end users interact with by sending keyboard and mouse clicks over network connections. Simplicity has its value: Presentation virtualization can accommodate a wide variety of hardware clients and operating system combinations.

And applications present a standard look and feel, which means users typically won't have to undergo extensive or individualized training. Presentation virtualization also enables dynamic resource provisioning and heightened security by keeping data and applications centrally managed and secured in data centers.

Presentation virtualization is particularly appropriate for departments and organizations in which large groups of staff perform similar roles using the same application, such as help desks and call centers.

Application virtualization: This client computing approach, in which users run server-based applications temporarily on their desktops, opens the door for a wide range of device types, including traditional thin clients, zero clients, smartphones and tablets. Some organizations take a hybrid approach by segmenting application virtualization sessions on a fat client that also runs traditional implementations of productivity applications locally.

Segmentation also protects organizations that allow smartphones and tablets for work and personal use. This means IT managers can wall off the organization's data and applications so they're protected by security policies when accessed from outside the office. And because a portion of the streamed application runs locally, mobile users can work offline and then sync their data with data center servers when they re-establish a network connection.

Application virtualization (and its variations) is a more flexible platform than presentation virtualization because it gives IT managers more alternatives for tailoring computing environments to specific applications. For example, there are a greater number of devices to choose from, so end users aren't limited to one-size-fits-all terminals to do their work. Typical users of application virtualization include inspectors, administrative staff, and procurement and contracting professionals.

Virtual desktop infrastructure: The VDI architecture, which creates customized virtual desktops with a personal look and feel for each user, offers a way for workers to run complete versions of applications, including Microsoft Office, while still benefiting from the management and security advantages of housing IT resources centrally in a data center. VDI also accommodates the range of fat client and thin client hardware.

And once an organization selects the hardware, staff with similar responsibilities can share devices. For example, after call center personnel on the day shift log out of their thin clients at 5 p.m., staff on the night shift can sign in on the devices and access their own custom VDI desktops stored in the data center.

VDI may also be appropriate for fieldworkers, teleworkers, department managers and administrative staff. Similarly, VDI offers an efficient way to provide new hires with access to applications from nearly any available hardware.

Device Decisions

Matching client computing architectures with the right end-user hardware is a balancing act between technical requirements and each user's needs. As the "Client Computing Scorecard" sidebar shows, the hardware choices are pretty clear-cut for presentation virtualization. Because there is no data processing in the client devices, the hardware can be basic, with only the bare minimum in terms of processors and onboard memory.

This makes the least expensive thin clients and zero clients a safe choice. However, presentation virtualization relies heavily on the network infrastructure for sending information between servers and clients. So organizations may need to plow portions of their savings from the low-cost thin clients back into network upgrades.

Application virtualization offers more hardware options, but along with that comes higher minimum requirements. Thin clients need to be equipped with midrange processors and adequate memory to run applications locally. Nevertheless, organizations can still take advantage of units that cost less, draw less power and last longer than pricier PCs.

VDI can also accommodate a wide range of client hardware alternatives, as long as the gear has enough onboard processing, memory and storage space to run virtual desktops. Both VDI and

CLIENT COMPUTING SCORECARD

The right combination of architectures and devices can deliver efficiency and security benefits for a wide range of applications.

Architecture	Client Hardware	Pros	Cons	Best Use
Presentation Virtualization	Thin clients, zero clients	Easy to manage, with modest client hardware requirements	Requires network connectivity and is sensitive to network performance issues	Call centers, help desks
Application Virtualization (and application streaming, profile virtualization)	Desktop PCs, thin clients, zero clients, mobile clients, notebooks, tablets, smartphones	Works with a wide variety of client hardware and doesn't need network connectivity	Requires high-performance, more costly devices	Teleworkers, inspectors, call centers, administrative staff, procurement
Virtual Desktop Infrastructure	Desktop PCs, thin clients, zero clients, mobile clients, notebooks, tablets, smartphones	Creates highly customized work environments for each user	Requires high-performance clients and server virtualization in the data center	Call centers, fieldworkers, teleworkers, department managers, administrative staff

application virtualization are becoming reliable options for mobile devices, including smartphones and tablets that have dual uses for work and personal applications.

Infrastructure Considerations

The next important area of concern is the overall IT infrastructure that will support the client computing initiative. Organizations must pay particular attention to servers, networks and storage systems because these will determine the success of the client computing endeavor.

All of the various client computing architectures have one thing in common: They rely heavily on the power and availability of data center servers for housing and running applications, and managing interactions among hundreds or thousands of individual clients. IT managers need to review current server capacity and determine how much, if any, excess processing power can be devoted to client computing.

In many cases, an investment in new servers will be necessary to assure that strains in the data center don't reduce the productivity of thin client users. If that were to happen, it could impair ROI and create a backlash against the entire project.

In addition, an established or evolving server virtualization strategy is a must-have complement to client computing. Server virtualization helps push physical servers to their rated processing capacity, resulting in less idle time, which in turn translates into smaller investments for hardware.

Server virtualization also allows for dynamic provisioning of computing resources so IT managers can quickly provision available processing power from the server pool to address fluctuating demand in the desktop environment.

The network infrastructure must support significant new demands as clients and servers exchange screen images, keyboard clicks, applications and data. IT managers should evaluate bandwidth limits by testing throughput and latency, and pay particular attention to how well the infrastructure handles large graphics files.

In addition to increasing network capacity where needed, organizations should use data compression to reduce the size of packets crossing the network and optimize available bandwidth.

A third piece of the infrastructure puzzle, storage, will also have a direct impact on the overall performance of the client computing rollout. Assess storage requirements by gauging the read-and-write volumes expected from the thin client population when the implementation goes live and carefully monitor over the first couple of years that the system is in place.

To maximize performance while managing costs, consider storage tiering. This technique classifies individual data sets by relative importance and age and then stores them using the most appropriate storage technology, based on cost and performance capabilities.

Thin Client Support

Thin clients may not need as much attention from IT technicians as traditional PCs, but that doesn't make them set-it-and-forget-it technology. It's true that thin clients typically enjoy a longer lifespan compared with traditional PCs because they do less local processing and don't need a regular refresh to capitalize on new CPUs and related performance boosters.

But organizations that keep their thin clients around for five to seven years still need to stay current on upgrades to the client's operating system and firmware. Although client computing eases the burden of software upgrades and security patches by centralizing applications and hardware, changes to device-level operating systems and firmware require a site visit.

On the plus side, device-level upgrades are infrequent and can be installed at a manageable pace that shouldn't overburden the IT staff. However, if the device or operating system manufacturer issues an alert about a newly discovered security problem, an immediate response is essential.

The IT staff must have a strategy for quickly installing manufacturer-supplied fixes to every device — and preferably not one that's devised in the middle of an emergency. Such contingencies should be addressed during the planning stages prior to deployment.

IT managers should also look for software management suites that are tailored to the standard and proprietary operating systems common to thin clients. The suites should include a central console for managing upgrades, controlling and provisioning resources for individual clients and connecting new hardware to the environment. The tools should also accommodate exceptions so that IT administrators can alter enterprisewide settings when necessary to address the needs of individual departments.

Management Best Practices

Once a client computing initiative is up and running, IT managers need a plan for maintaining the environment's health and welfare. A good strategy will focus on the following four important tasks.

1. Pay close attention to endpoint security. IT can centralize many security policies and activities within data centers, which is an advantage for achieving tight control over access authorizations and security patching. However, that doesn't address all potential vulnerabilities.

The USB ports that most client devices use for attaching peripheral devices are a weak point for security. Whether malicious or not, a user can easily plug a USB thumb drive into one of these ports to download sensitive information or even introduce malware that can quickly spread through the network.

The same best practices used to secure traditional environments also apply to thin client settings. Establish and communicate clear data access policies so users understand how to manage the information that they are authorized to access. The policy should include guidelines for moving data out of the work environment.

To help with policy enforcement, install encryption and data loss prevention (DLP) applications to scramble data before it's downloaded from a thin client. Be sure to log when downloads take place on each machine. Close monitoring of devices can provide an early warning system to alert security managers to potential breaches. Data encryption will also help protect information as it travels between servers and thin clients.

2. Review all software licenses. In their current form, contracts for operating systems and applications may not transfer to environments designed for client computing and virtualization. Note that this is a quickly evolving area, and licensing requirements are subject to change.

For example, for a time Microsoft required adopters of VDI to conform to its Virtual Enterprise Centralized Desktop licensing model for Windows clients. Microsoft changed course in 2010 and dropped additional requirements for PCs already covered by Windows Client Software Assurance (SA).

The company also introduced a new licensing model specifically for thin clients, Windows Virtual Desktop Access, or Windows VDA. The take away: Navigating the changes in software agreements relevant to a client computing environment is challenging and may require the help of an outside software licensing specialist to guard against unexpected compliance problems.

3. Beware of bricking. Bricking is slang for when a thin client crashes because of internal software problems or damage to the client's virtual desktop image. To restore a "bricked" device, IT managers must repair the image, which usually requires a time-consuming service call.

Manufacturers of thin clients say that image corruption often occurs when users make unauthorized changes to thin client software or install unsupported peripherals. Communicating and enforcing usage policies is important to avoid this type of client downtime.

4. Prepare for culture shock. Although IT managers may quickly grasp the benefits of client computing and centralized IT resource management, users may not embrace the strategy immediately. It represents a significant shift from having dedicated, full-power PCs on each desktop and may even lead some users to worry about increased surveillance of their work activities.

Organizations can overcome these fears with careful change management. First, make sure everyone understands the potential advantages, including less downtime and system crashes for users. Use a pilot demonstration to show how the environment works. And allay fears that graphics quality and performance will be inferior to that of traditional PCs.

Don't take chances during the initial rollout. Schedule enough IT and help desk staff to triage any problems and address questions that come up about accessing the environment and running applications.

Note that user skepticism is another reason why the infrastructure assessments and upgrades are so important. Understand that it will be difficult to overcome negative reactions about any breakdowns in the environment that occur in the first days of going live.

Beyond Cost Savings

Each decision about underlying client computing technology, upgrades to IT infrastructures and management practices contributes to the eventual success of the initiative. This is one reason why it's difficult to generalize on ROI and the potential cost savings of client computing.

For example, organizations can easily reduce their spending for hardware by purchasing economical thin clients. How much of that savings is a net gain and how much will need to be used to build up networks or buy additional servers differs from organization to organization.

Research shows that client computing savings are real. However, savings vary by department and accrue over years rather than months, as longer refresh cycles and fewer help desk calls add up to bottom-line benefits.

Still, don't get hung up on cost savings. Client computing offers other benefits as well, including reduced management overhead for the IT staff and improved customer and constituent services. These benefits may be even more important to the organization's success in the long run. Client computing can be the answer for old and inefficient PCs that sap productivity and keep organizations from fully meeting their goals. ■

This glossary serves as a quick reference to some of the essential terms touched on in this guide. Please note that acronyms are commonly used in the IT field and that variations exist.

Glossary

Application virtualization
This form of client computing only presents screen images, not the full applications, to run on local client hardware. Unlike presentation virtualization, application virtualization lets users continue to work locally in the absence of a network connection and then send updates to the central servers when links are re-established.

Bricking
This term is slang for when a thin client ceases to operate, often because of internal software problems or damage to the client's virtual desktop image caused by unauthorized changes to internal software or unauthorized peripherals.

Centralized management
Centralized management is a strategy that concentrates an organization's IT resources within data centers or clouds so that hardware and software can be easily controlled by administrators. Centralized management is an alternative to housing computing resources within individual desktop and portable computers.

Client computing
An IT infrastructure strategy, client computing concentrates processing power and applications in central data centers or clouds and delivers the resources over networks to individual desktops.

Client virtualization
Client virtualization refers to a variety of strategies for enabling applications and other aspects of a user's computing environment to be stored on central servers and delivered to various types of client devices.

Cloud computing
Cloud technology groups computing resources in logical and physical pools that may reside within an organization's physical environment, or be managed by an outside provider that makes the resources available on demand.

Consumerization of IT
This term refers to a growing trend in which users have influence in choosing the hardware they use in work environments. Consumerization has resulted in larger numbers of smartphones and tablet PCs that double as personal and professional devices.

Continuity of operations plan
A COOP plan is a formal written description of specific policies and procedures that will help an organization maintain operations during a natural or human-caused disaster. COOP strategies also include disaster recovery guidelines to help organizations quickly recover from outages.

Dynamic provisioning
Dynamic provisioning refers to the ability to quickly allocate IT resources using pools of computing power, applications and storage capacity.

Electronic Product Environmental Assessment Tool

EPEAT is an online utility that is designed to help buyers compare the environmental characteristics of computing equipment. Managed by the Green Electronics Council, EPEAT is based on standards developed by the Institute of Electrical and Electronics Engineers (IEEE) and has been used to certify more than 1,500 models of thin clients.

Fat client

A fat client is a traditional desktop PC or notebook computer with full-power processor, hard disk and sufficient memory for running applications and storing data locally.

Mobile thin client

A mobile thin client is a type of thin client that consists of a small portable-computer package with an LCD screen, keyboard, basic CPU and minimal memory. Like other thin clients, mobile clients lack a hard drive and rely on connections to central servers for additional IT resources.

Nonpersistent desktop

As opposed to a persistent desktop, a nonpersistent desktop is a computer that doesn't store unique computing-environment preferences for each user.

PC over IP

PCoIP is a compression protocol for zero client systems designed to improve graphics performance, particularly over WAN connections. PCoIP also natively encrypts data that travels between central data centers and client computers.

Persistent desktop

Different than a nonpersistent desktop, a persistent desktop is a typical user's computing environment, including a home screen and menu of applications, that is saved in data center servers and downloaded to client hardware each time the person successfully signs on to the network.

Presentation virtualization

Presentation virtualization is a client computing architecture in which all of the program execution and data creation performed by users takes place on centralized servers. Rather than working with full versions of software on local hardware, users download screen images of an application and manipulate the software by sending keyboard and mouse clicks over a network to host servers.

Profile virtualization

Profile virtualization distinguishes each user's personal profile data from the documents they have created and stores the profile information centrally.

Server virtualization

Server virtualization technology makes it possible to create bundles of operating systems and applications and run multiple bundles on the same server hardware. It lets network administrators easily move bundles, known as virtual machines (VMs), between physical machines connected on a network.

Stateless environment

A stateless environment is a type of computing environment that runs on a client device only when the device is being used and disappears when the client is powered down. It's opposite to a stateful environment, in which a desktop PC saves the user's profile to memory and restores it during boot up.

Storage area network (SAN)

A SAN is a subnetwork of storage devices connected to a network and accessible to an authorized cross-section of clients. SAN storage is one way to provide capacity for diskless thin clients.

Thin client

Desktop hardware often about the size of a hardbound book, a thin client contains a CPU, memory and an assortment of device connectors, but lacks a hard disk for storing applications and data. Thin clients rely on associated servers to provide additional IT resources.

Virtual application streaming

This client computing architecture uses central servers to host full versions of applications and send data and portions of the programs to desktop clients. Data manipulation and processing takes place on the local client computer.

Virtual desktop infrastructure

VDI is a client computing technology that creates virtual machine bundles of operating systems and applications for each end user and then downloads the VMs for use on desktop hardware.

Virtual machine

A VM bundles an operating system and applications and may be easily moved among physical servers. VMs can also be used to encapsulate work environments for individual users in virtual desktop infrastructure architectures.

Windows Virtual Desktop Access

This licensing model, known as Windows VDA, was created by Microsoft for thin clients operating in Windows environments.

Zero client

A zero client differs from a thin client in that it lacks an embedded operating system. Instead, it pulls the entire operating system from its server host, along with centrally delivered applications and data. This strategy minimizes setup, configuration and maintenance chores at the desktop. Zero clients come as a book-size device or may be integrated with a monitor.

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LOOK INSIDE FOR MORE INFORMATION ON:

- Determining the right client architecture for your organization
- Working client computing into a COOP plan
- Infrastructure considerations for client computing
- Managing and supporting a client fleet

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