



A Teradici White Paper

Transforming the Business Desktop

PC-over-IP™ Technology Reinvents Computing

Personal computers revolutionized business by giving users a rich and customizable application environment which was a vast improvement over the dumb terminals that PCs replaced. But the widespread deployment of desktop PCs also created growing management and security challenges.

Corporate IT managers are supporting an expanding number of desktop configurations, applications, user types, and peripherals that are difficult to manage and costly to operate. In addition, high profile data and physical security breaches have heightened concern over the vulnerability of PCs that are distributed throughout the enterprise.

These management and security concerns are pushing IT organizations to consider centralized computing models wherein the computing and storage resources (in the form of PC blades, servers or virtualized desktops) are centralized in a secured datacenter. However, until now, the full user experience including visual performance and responsiveness, audio/visual synchronization, and peripheral compatibility has suffered, creating an obstacle to widespread acceptance.

Teradici has developed groundbreaking technology that for the first time eliminates these user experience limitations. By designing advanced image processing algorithms implemented in a highly integrated, optimized silicon chip, Teradici delivers a true, uncompromised PC experience over standard IP networks. By enabling this full PC experience, Teradici will help accelerate the drive to centralized computing.

This whitepaper examines the growing challenges of business desktop management, introduces the Teradici technology and benefits, and describes how centralized computing solutions based on Teradici reduce total cost of management.

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Growing Challenges in Business Desktop Management

IT organizations face a growing set of challenges that become more complex as user needs, software and infrastructure rapidly change. In addition, CIOs are under increasing pressure to improve processes and control operating costs according to Gartner's most recent survey of over 1400 CIOs worldwide (source: Gartner EXP CIO report on the 2007 CIO Agenda). As a result, IT managers and CIOs are motivated to find new ways to address the growing challenges posed by traditional PC deployments that include:

- PC desktop management is time consuming and costly: dealing with an often unwieldy number of desktop computers that constantly require software updates, desk-side service calls and hardware refreshes requires extensive IT manager time. This translates directly to higher on-going maintenance costs.
- Reliability of distributed PCs is relatively poor: compared to centralized high-availability servers, distributed PCs face a myriad of issues that negatively affect business continuity. Both software and hardware failures still require costly desk-side support despite advances in remote management software.
- Physical aspects of PCs conflict with user environments: many workspaces such as those in hospitals, manufacturing plants and trading floors are not amenable to the large footprint, power draw, heat generation, ventilation requirements and noise output of traditional box PCs. Within these organizations, IT managers are looking for ways to create more efficient workspaces by making computing resources less obtrusive.
- Asset and data security are easily compromised: with local storage and USB access ports on PCs spread throughout an organization, fully guaranteeing the security of important data and key assets is impossible. In a business climate of ever more stringent regulatory requirements, this is creating increasing headaches for IT organizations.

These fundamental challenges have driven the growth of new centralized alternatives to the traditional distributed PC model. Server-based computing, thin clients, desktop virtualization and PC blades all address the common IT challenges listed above to varying degrees. However, each approach compromises the end-user experience when it is delivered over an IP network. This trade-off has ultimately slowed the adoption of these alternatives.

2007 Business and CIO Priorities

Business Near-Term Expectations of IT

- Improve business process
- Control enterprise cost structure
- Attracting, retaining and growing customers
- Improve workforce effectiveness
- Grow revenue

Source: Gartner EXP CIO Report (February 2007)

Introducing Teradici and PC-over-IP Technology

Teradici reinvents computing by eliminating the barriers that slowed the growth of previous centralized approaches. As a fabless semiconductor company, Teradici's core technology enables products to deliver a true PC experience over IP networks. The unique Teradici PC-over-IP technology is composed of advanced I/O bridging and image processing algorithms, implemented in highly integrated chips called PC-over-IP Processors. The technology enables the physical separation of the computer and the user while maintaining an uncompromised user experience.

Teradici PC-over-IP Processors

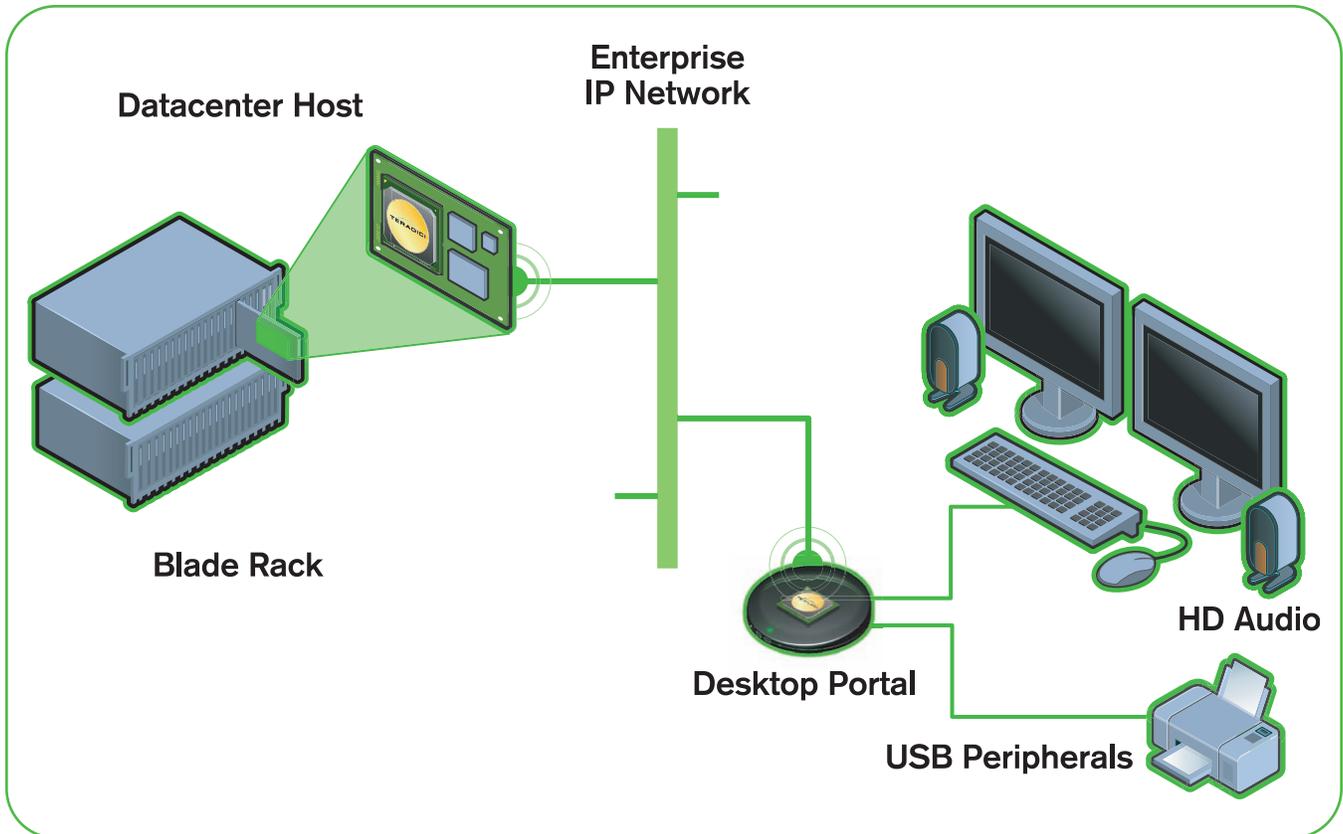


In a PC-over-IP solution, only a display and a user's peripherals remain at the desktop connected to a device referred to as a "portal." The small, state-less and zero-management portal contains external peripheral connections, an Ethernet port, and the Teradici PC-over-IP Processor. The portal transparently bridges displays, high definition audio and full USB connectivity to centralized computing resources in the datacenter across a standard enterprise network. The host computing resources can be in PC blade or racked server formats. Each host houses its own PC-over-IP processor in addition to all of the standard computing components such as main processor, graphics card, memory, storage and other I/O. The solution provides an instantaneous, transparent connection between the user and the host computer without any compromises in performance, application support or connectivity.

A key difference between Teradici and conventional approaches is that products using PC-over-IP technology do not require any application computing resources at the user's desktop. PC-over-IP portals never execute any application code and there is no local operating system to maintain. As a result, portals are far easier to manage and secure than traditional PCs and thin clients. This also means that the host computer has no applica-

tion restrictions and users have no performance penalties resulting from the physical separation of the user from the centralized computing resource. By eliminating the trade-offs that had been associated with centralized computing systems in the past, Teradici and its partners can now accelerate the adoption of this new computing alternative into the enterprise.

Teradici PC-over-IP Processors



Benefits of Deploying PC-over-IP Solutions

With enabling technology from Teradici, its OEM partners can deliver centralized computing solutions with powerful benefits and no trade-offs. These benefits map directly to the common challenges faced by IT managers and include:

- Simple, efficient and low cost compute resource management. Since all active compute resources are centralized in a datacenter and portals at user desktops are completely state-less, management is dramatically simplified. IT staff can eliminate most desk-side visits because typical support activities including software and OS updates, asset audits, hardware upgrades, and configuration management can be carried out in the datacenter. The result is more efficient use of IT staff time which translates directly to cost savings for the organization.
- Unprecedented reliability for end-user computing. IT managers now have the ability to dynamically allocate portals to centralized computing resources as demanded by business continuity needs. In the event of a compute resource failure, a user can be re-allocated to another resource almost instantaneously. Since the portal devices are stateless, low power and have no moving parts, their reliability is far greater than that of a desktop PC, further minimizing the need for desk-side visits.
- Easily integrates into any end-user environment. A Teradici-based portal is very small since all primary functions are integrated into a single PC-over-IP Processor. Its low power operation means cooling fans are not required so portals can be sealed from contaminants, dust and other environmental hazards. Even in normal office environments, portals give end-users more space and eliminate the heat and noise typically associated with PCs.
- Complete control over asset and data security. PC-over-IP technology enables the complete removal of all data storage assets from the user environment by placing them in a centrally managed datacenter. Since each desktop is centrally configured for each user, IT managers have complete control over personalized profiles to restrict or prohibit access to USB peripherals like flash drives. These privileges can be centrally managed, assigned dynamically, and associated with users.

Beyond these core benefits, PC-over-IP technology uniquely delivers advantages that preserve the true PC experience. These additional benefits will enable the accelerated growth of centralized computing:

- True and uncompromised display for end users. With PC-over-IP technology, a user's portal delivers the complete and uncompromised graphical environment that they are used to with full support of motion video, 3D graphics and multimedia. The full power of the host CPU and graphics card are transparently delivered to the user's portal via an all-digital path that terminates in one or more standard display connections. This removes the significant usage barriers that exist today with traditional thin client, PC blade and virtualization solutions.
- Completely independent of application software and operating systems. Because portals are free of local applications and because the interface extension is transparent, there are no operating system, application or driver dependencies. This means IT managers and end users do not need to change how they use, maintain and upgrade their software and host operating systems. For example, the technology fully supports new operating systems such as Microsoft Vista without specialized updates and drivers.
- Full USB and audio peripheral support. With a PC-over-IP system, traditional devices such as scanners, printers, microphones and even video cameras can be supported without any of the typical pitfalls and compatibility issues that conventional thin-client deployments experience. Transparent extension of USB and high-fidelity audio in and out means no special drivers are required so that users have the same device flexibility they had with PCs with one exception: IT managers can remotely control and restrict device connections if desired, by individual portal or according to user groups.

Summary of Benefits Enabled by Teradici

Core Centralized Computing Benefits

- Simple and efficient manageability
- Unprecedented reliability
- Easily integrates into any environment
- Complete control over security

Unique Advantages of PC-over-IP

- Application and OS independent
- Full USB peripheral support
- HD audio in/out
- Uncompromised visual experience and response

Lowering Total Cost of Management

Ultimately, the benefits of centralized computing add up to significant operating cost savings for an organization. The acquisition cost of a desktop PC is only about 20% of the total cost of management (TCM). The other 80% (\$1,956 annual per user according to Endpoint Technologies) is due to the cost of installing, supporting, troubleshooting, moving, patching, training and fixing desktop PCs that are spread throughout the organization.

While the acquisition cost of centralized computing is typically higher than traditional desktop PCs, the TCM over a 3-4 year life span is dramatically lower. According to an analysis by Roger Kay, President of Endpoint Technologies Associates, customers that move from distributed PCs to centralized PC blade systems can reduce their annual operating costs by 44% (down from \$1,956 to \$1,093 annually). The figure below details the source of the savings.

PC-over-IP technology is instrumental to further reducing this TCM because it simplifies the portal to the extent that no IT management of the desktop device is necessary while delivering a familiar and complete PC

experience. The Teradici-based portal does not require an operating system and runs no local applications so it does not have to be upgraded or patched.

Hard cost savings include:

- Reduction in required support staff due to reduced
- Reduction in physical loss of hardware and damage by users
- More efficient use of power and cooling resources in the datacenter

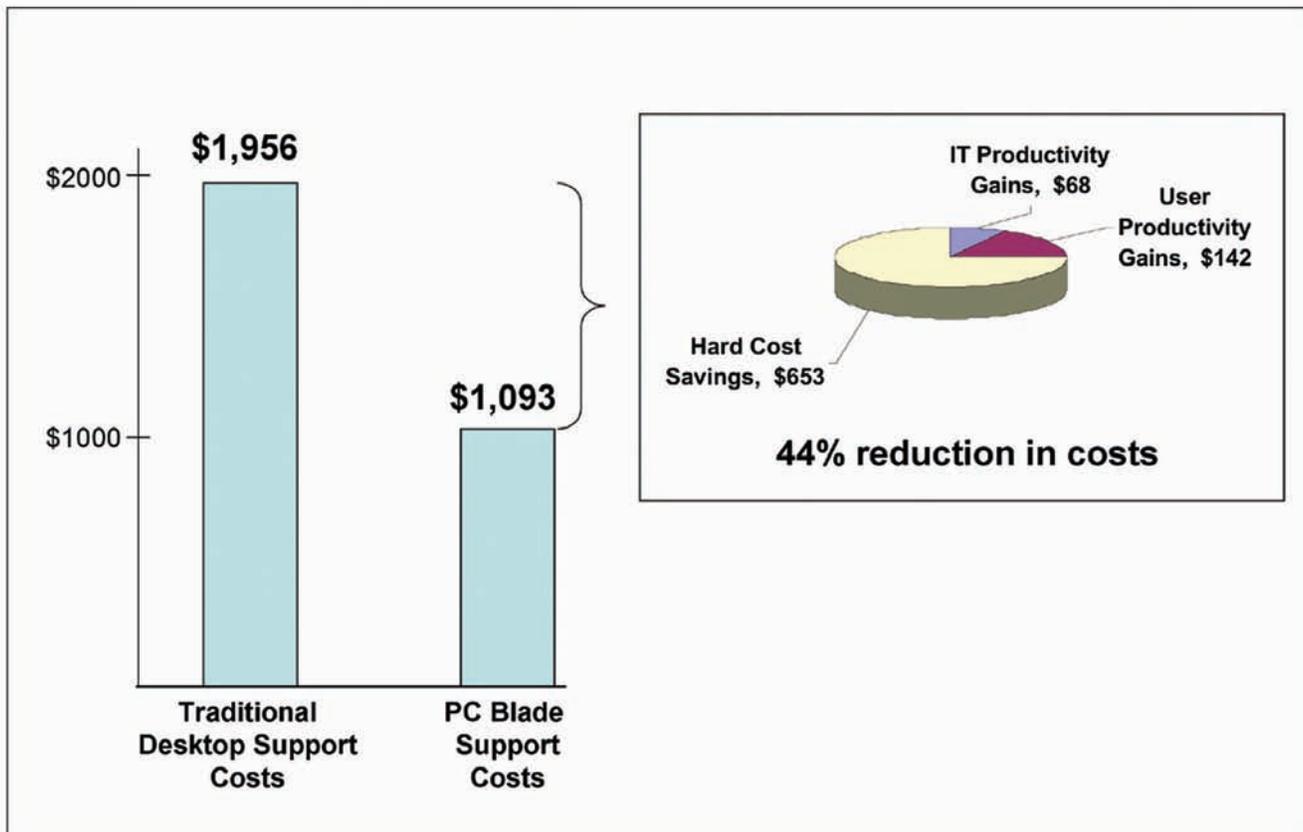
IT productivity gains are from reductions in time required to:

- Execute Moves/Adds/Changes
- Install and upgrade systems
- Patch and install applications on the desktop

User productivity gains include:

- Higher uptime as centralized equipment is much more reliable due to stable operating environments and exposure to user-induced accidents is eliminated
- Faster help desk resolution since IT staff can actively monitor and hot-swap computing resources
- A fully familiar and consistent user experience

Average Annual Costs and Savings per User with Centralization



Source: Endpoint Technologies Associates, Inc., 2007.

IT Cost Benefits of PC-over-IP Solutions

| <i>PC-over-IP Solution Feature</i> | <i>IT Support Cost Benefits</i> |
|--|--|
| <ul style="list-style-type: none"> • Zero-management of desktop devices | <ul style="list-style-type: none"> • No staff time necessary for desk-side support visits for upgrades, installs and service |
| <ul style="list-style-type: none"> • Compatible with existing applications and drivers | <ul style="list-style-type: none"> • No time required to test, tweak or custom configure software to run in a centralized computing environment |
| <ul style="list-style-type: none"> • Future proof support for OS and software | <ul style="list-style-type: none"> • No need to replace or upgrade desktop hardware when doing OS or application upgrades |
| <ul style="list-style-type: none"> • Full support of standard desktop peripherals, audio and displays | <ul style="list-style-type: none"> • No time needed to debug USB redirection software or develop custom device drivers |
| <ul style="list-style-type: none"> • True PC response and display quality | <ul style="list-style-type: none"> • No special training of users or IT staff and no tuning of the desktop graphics |

Summary

Centralized computing represents the biggest shift in desktop computing in over 20 years. Although the segment has grown rapidly, it has faced a major obstacle in that the user-experience has not matched that of a standard PC. The Teradici PC-over-IP technology enables products that can deliver a true, uncompromised end-user experience. By incorporating Teradici-based centralized computing solutions, IT organizations can:

- Dramatically improve manageability and lower their Total Cost of Management
- Give end-users unprecedented levels of reliability and in turn reduce IT support time
- Simply and effectively deploy computing in any environment
- Maximize and centralize security and control
- Deliver a true desktop PC experience for their end users with full peripheral, graphics and multimedia support

To learn more about Teradici's PC-over-IP solutions and how they can help re-invent your IT environment, please visit: www.teradici.com.

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