

Teradici PCoIP Technology: Unleashing the power of remote visualization

WHITEPAPER

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New challenges mean new opportunities

It's a time of unprecedented challenges for business. It's also a time of unprecedented opportunity.

This double-edged sword comes courtesy of the incredible pace of innovation in information technology (IT). It lets business rivals hone their competitive position, by harnessing new tools to increase productivity, access new markets, and leverage global resources to reach customers, partners and employees alike. It also lowers barriers to entry and the cost of doing business, inviting more entrants to participate in an ever-more competitive landscape.

At the same time, we also witness periodic technology advancements that trigger shifts in how things get done – shifts that allow nimble, vigilant businesses to address new challenges, adapt quickly to changing market trends and emerging competitors, and serve customers more effectively.

A centralized model for high-performance, remotely-rendered, workstation-caliber visual computing —the Teradici PCoIP® Remote Workstation solution — represents one such shift. It allows businesses to securely share one common data set, with rich, interactive visuals, on virtually any device, to users around the world, 24/7. Best of all, it's an approach that directly addresses many of the most difficult problems businesses are facing today.

Businesses pressured on every front

Building a competitive, robust business — and keeping it that way — has never been easy. But many would argue that today's climate has never been tougher, with a whole host of new challenges pressuring both IT environments and business model.

It all sounds great in theory ... spreading beyond geographic and cultural boundaries to exploit and serve opportunities in all corners of the globe. Yet **globalization** presents its own double-edged sword, as that appeal is countered by a whole lot of additional operational complexity. It's something every business will have to address, sooner or later, one way or another.

All businesses today operate on a backbone of digital information ... not just on-line retailers. And all are dealing with an **explosion of data**, spurred both by our prolific ability to generate data, as well as the incredible capacity for modern computing devices to consume it. That goes double for compute-intensive fields like computer aided design (CAD), digital media and entertainment (M&E), energy, science and research, healthcare, and finance.

Hand in hand, the **demand on visualization** is growing exponentially, driven by the growth in raw data and ever-rising expectations on visual quality. In the age of photo-realistic games and Hollywood blockbusters, neither creator nor consumer wants to deal with clunky, slow 3D visuals. Expectations are just as high when it comes to ease of access, because today's mobile workforce demands access to that visual content wherever and whenever they want it.

Then factor in the **security** of that data in a global, everywhere-connected, increasingly transparent digital landscape. Security concerns have reached a critical point, with mobile employees and contractors taking valuable corporate IP out of the office and into a very public digital domain, including airports, WiFi equipped planes, and coffee shops. How can an aggressive, dynamic, and mobile organization push its business agenda, while protecting the IP that makes it a viable business in the first place?

It's hard enough managing enterprise information on computing devices standardized across personnel and company sites. But then consider the additional complexity of not one but myriad, heterogeneous devices, brought in by employees. The **Bring-Your-Own-Device (BYOD)** trend is not going away, but something that every enterprise IT department must address as securely and unobtrusively as possible.

Finally, businesses need to address each of these dynamics while operating in a competitive climate that's never been more unforgiving, with more competitors, tighter schedules, and thinner margins. Yet while the advancement of technology is helping create many of these new problems, it's also presenting the means to address them.

A shift to a centralized computing model is the answer ... but with one, crucial improvement

From an IT perspective, there's no one magic bullet to solve every problem. But where there are problems, there are solutions. Many businesses are making the transition toward a more centralized computing environment. Keeping data in one central premise — be it a workstation under the user's desk or rackmount machine in the backroom — alleviates many of these thorny issues, improving collaboration, mobility, and easing security concerns, in global enterprises dealing with big-data problems.

But while that model has provided an effective solution for applications that demand little in the way of visual complexity, it hasn't been sufficient to support high-demand, graphics-intensive computing. And for good reason..... the requirement for very high bandwidth combined with very low latency has historically demanded that complex, 3D visual data and display be located in the same place, on the client. As a result, big-horsepower clients like desk-side workstations and high-performance PCs have continued to exclusively carry the load for applications ranging from gaming to CAD, M&E, and geoscience.

The Teradici PCoIP Remote Workstation solution

Creating a centralized model that can deliver an interactive, graphics-intensive experience, demands a novel IT solution. In 2007, Teradici introduced just such a solution, with patented technology that has become the linchpin in the shift of high-performance visual computing to the datacenter. Based on over 50 patents and supported by a global partner ecosystem of over 70 OEM/ISV partners, Teradici PCoIP remote workstation and virtual desktop infrastructure (VDI) solutions are now deployed in millions of installations around the world.

The Remote Workstation solution

The Teradici PCoIP Remote Workstation solution delivers anytime/anywhere, high-demand visual computing from a Windows or Linux platform by transmitting the user's host-rendered workstation desktop to a remote display. Three basic components comprise the solution: a remote workstation host, which renders, encodes, and transmits the desktop image; a remote workstation client that displays the remotely rendered image; and an IP network (LAN or WAN) that connects the two.

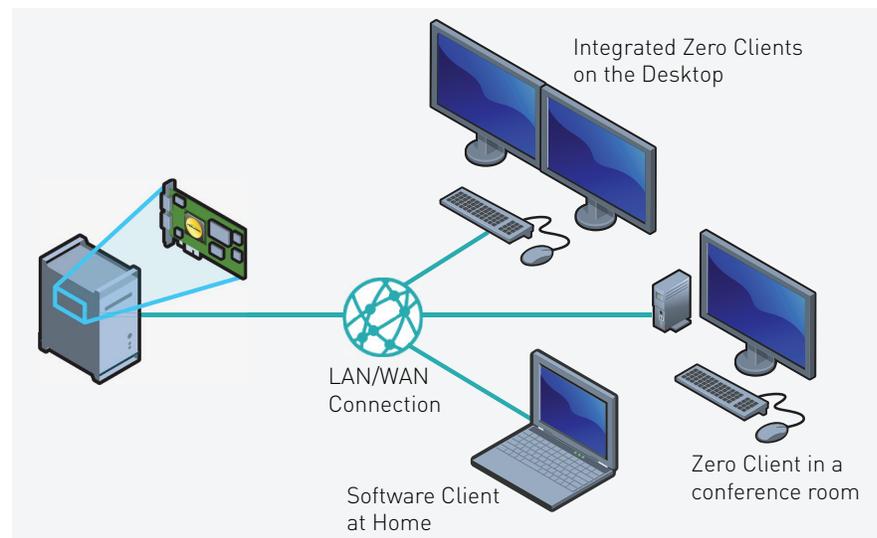


FIGURE 1: Teradici's PCoIP Remote Workstation Solution provides workstation access to a range of platform-agnostic clients, both on site and off

The host renders the image, and the resulting pixels are encoded and encrypted specifically for the type of media being transmitted, optimized for lossless transmission over standard IP networks, and delivered to a secure client for display. Altogether, this results in a 3D design environment that can be accessed in full fidelity from around the office, or from the other side of the globe — without the source data ever leaving the security of the premises (datacenter or under-the-desk).

The Remote Workstation Host

In the Remote Workstation topology, the host — be it a conventional, under-the-desk workstation, or a rackmount workstation (e.g., rack or blade) in the backroom — is responsible for both rendering images and transmitting resulting pixels over IP. Most any machine running Windows or Linux will suffice as a host, provided it is outfitted with two key hardware components: a Graphics Processing Unit (GPU) and a Teradici PCoIP Remote Workstation Card.

The Host GPU

The GPU, available as a standard PCI Express card from NVIDIA or AMD, renders the application's visual content, frame by frame. GPUs are ubiquitous in workstations today and are becoming more common in server racks as well, supporting both remote visualization as well as high-performance compute (HPC) acceleration. Compatible GPUs output display pixels via either a DisplayPort or DVI-D connectors, features common on virtually all professional-caliber graphics cards today.

The PCoIP Remote Workstation Card

Teradici PCoIP Remote Workstation Cards implement patented PCoIP technology, which decomposes frames to pixels, applies multi-codec compression, encodes those pixels, and then ships the encoded stream over the network to the remote workstation client. These PCI Express cards come in three basic flavors that cover the breadth of host requirements: a full-height, half-length card that fits most workstation towers, a low-profile card optimized for Small Form Factor (SFF) workstation and rackmount servers, and the AMD FirePro R5000, a combination GPU+PCoIP solution.

The full-height card supports quad-display at 1920x1200 resolution, while the low profile card can manage two screens. And for the ultimate all-in-one hardware solution, Teradici partner AMD has made available the AMD FirePro R5000, a streamlined, single-card solution, integrating both a high-performance, workstation-caliber GPU and PCoIP® processor.

All Remote Workstation host cards can stream audio and USB data across the network to the client device. And since they are driver-less, PCoIP Remote Workstation cards are compatible with any platform, regardless of what operating system the host is running.

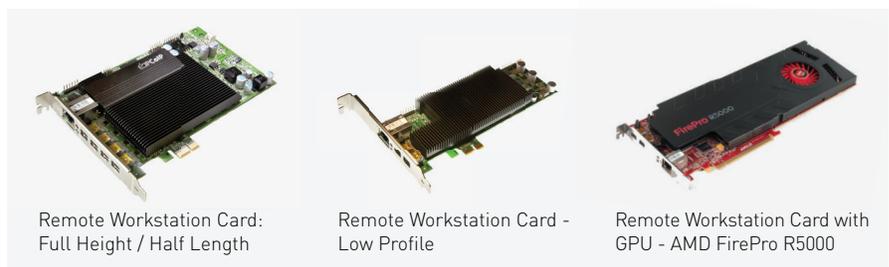


FIGURE 2: PCoIP functionality is deployed in a range of hardware options to serve the needs of virtually any application and system configuration

The linchpin: the Teradici PCoIP protocol with patented decomposition and encoding technology

While elegant in its approach, local display of a remotely-rendered image poses a major problem: how to get rich, high-resolution graphics down a narrow network pipe? Just one 1920x1080 video stream at 30 frames/second can create 250 Mbytes of raw data. Quality encoding with high compression is the answer, but the nature of the imagery produced in professional applications complicates matters.

Professional desktops see a wide range of visual types: synthetic 2D and 3D imagery, text, and natural images and video. And the most effective means to encode one is not the best to encode another. Accordingly, Teradici engineers devised a patented, multi-codec compression scheme that identifies and decomposes images into different types, encoding them separately through the optimal means for each type. The PCoIP protocol pays special attention to separating and encoding text, for example, given the eye is particularly sensitive when it comes to text fidelity. The protocol can deliver lossless anti-aliased and ClearType text in motion as well as lossless quality for static images.

Teradici PCoIP technology delivers remotely the quality of locally rendered images with both performance and security. Remote workstation cards can deliver up to 250 MPixels/second throughput, enough to drive up to four high-resolution 1920x1200 displays, or two ultra-high resolution 2560x1600 displays, at up to 60 frames/second. As a UDP-based protocol, PCoIP technology feature Dynamic Network Adaptation to deliver the best possible user experience, by dynamically adjusting compression rates to adapt to fluctuations in network congestion. The source data remains secure, never leaving the host. The pixel streams leaving the host are just as secure, encrypted in real-time with advanced security algorithms, like AES-256, and fully compatible with NSA Suite B cryptography — used by governments to protect classified information.

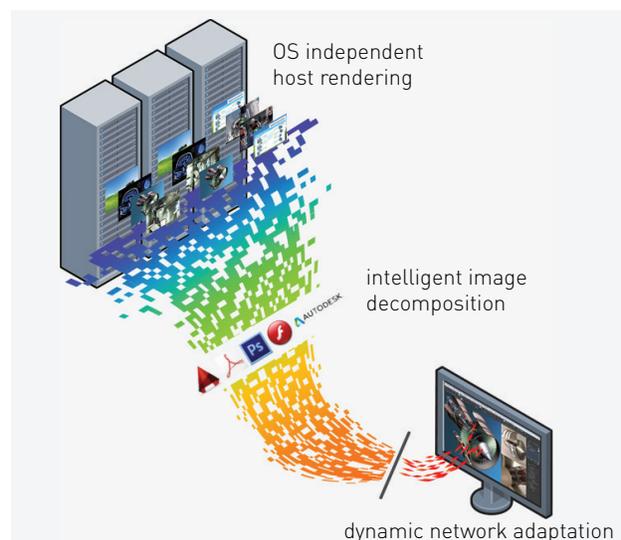


FIGURE 3: The Remote Workstation linchpin: PCoIP technology is patented, adaptive, multi-codec frame decomposition and encode

Remote Workstation Clients

Receiving only a stream of pixel data, the Remote Workstation Client can take one of several forms, none of which are complex or costly. Powered by the Teradici PCoIP processor and available from over 50 OEM vendor partners, PCoIP zero clients run no operating system at all, yet drive up to two 2560x1600 displays, or even four 1920x1200 screens. Virtually any corporate or consumer class computer will suffice, since PCoIP technology is OS agnostic, by design. Teradici PCoIP Software Clients turn any Windows PC or Mac into a device capable of displaying a 1920 x 1080 stream. The PCoIP Remote Workstation solution is compatible with software brokers from providers Ericom and Leostream, as well as VMware.

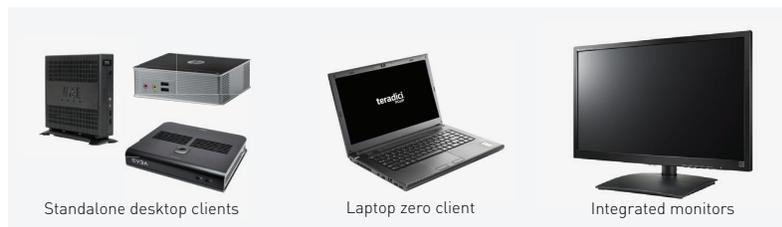


FIGURE 4: Available in a range of sizes, shapes and display support, PCoIP Zero Clients provide maximum security in compact, OS-agnostic packages. Also supports PCoIP Software Clients running on Windows or Mac laptops for flexibility

PCoIP technology serves up a wide range of benefits

More sensible allocation of computing resources for big-data applications

The benefits of centralizing data in workstation applications are many, particularly as the sheer volume of visual computing data continues to explode. A few minutes of a Hollywood-caliber scene shot in 4K and captured raw can exceed 100 GBytes. And in oil and gas exploration, surveys of potential drilling fields are both expansive and detailed, resulting in single data sets that can easily push into the Terabytes.

Storing and transferring raw data of that magnitude from workstation to workstation can chew up hours, shrink productivity, and open the door to security breaches. By leaving the data in one central location, accessible by a PCoIP client located on site or off, the Remote Workstation solution eliminates overhead and retains tight security.

Performance on the road ... without all the baggage (literally)

Consider a small architecture firm traveling weekly to the client's premises, showing work in progress or unveiling a final design. Any on-site collaboration would either mean waiting until they got back to the office to update, or constantly lugging around a bulky workstation and big disk arrays ... neither of which is very appealing. Instead, visualizing content stored on the user's workstation, back at the office, means collaborators can make those tweaks and review — interactively in real time — without sacrificing visual quality.

In the M&E industry, producers and executives can view dailies wherever they happen to be, in the studio, out on location, or home after-hours. Industrial Light & Magic, a division of Lucasfilm Ltd., leverages PColP remote workstation technology to enable effective collaboration among a fluid team of creative professionals, with staff working in transient satellite offices or even from home, without security concerns or the need for duplicate workstations. PColP technology preserves production values because it operates at the pixel level, ensuring 100 percent color matching and full HD, lossless image resolution.

Global collaboration with 24-hour productivity

With a centralized visual computing model, users don't have to be in their office, or even on the same continent ... especially valuable with modern enterprises scattered across the globe. With a PColP Remote Workstation solution, editors can work directly on digital files and share their work instantly with the rest of the team, wherever they happen to be.

And collaboration isn't limited to being in the same or adjacent time zones. It also provides the means to accomplish what was once a pipe dream for individuals and teams scattered around the world: working in a daytime-driven pipeline, where one team picks up at daybreak, just as another is going home at sunset.

Security

For many, the single most compelling feature of a centralized computing topology is security. The reason is obvious. Data remains behind the glass, and only pixels leave the physical premises. Even the pixels are secure, with the support of customizable, government-level security protocols and cryptography. And with a stateless PColP zero client — the ultimate choice for security and the only one of its kind available in the industry — the lack of any persistent state or full-fledged OS makes it virtually impossible to probe or hack with conventional malware. While it's an important issue to all businesses, security is of paramount concern to many, like Toyota Motorsport, GmbH, which exploits Teradici PColP technology to protect confidential, proprietary, and high-value client designs.

Client-agnostic

In addition to the maximum-security zero client, compatible clients include OS X Macs and Windows PC running PCoIP software clients. Specifically designed to be client-agnostic, the Teradici PCoIP Remote Workstation solution effectively addresses BYOD in the enterprise today, while providing an infrastructure that can adapt with an evolving, heterogeneous computing landscape.

Simplified IT management

PCoIP technology eases the burden and complexity of IT management, in more ways than one. Keeping traditional clients up-to-date with consistent configurations and resolving hardware/software issues has become a productivity-robbing time sink. Leveraging a centralized architecture, Teradici's complimentary, web-based PCoIP Management Console software utility makes deployment, updates, and upgrades across the enterprise a far simpler and more trouble-free process. Using the console, IT personnel can deploy, monitor and manage devices individually or broadcast settings to large groups, for fast and consistent configuration, security settings, firmware, backups ... even remote power management.

Its advantages in manageability get more appealing when considering the reality of many of today's dynamic project teams and businesses. Consider businesses like Zoic Studios, where projects ramp up and down fast, and staff can quickly expand and contract as work comes in and out. Adopting the PCoIP Remote Workstation solution, Zoic can now quickly move users around, without moving machines.

Extending the VDI model to workstation users

Many companies are expanding their IT infrastructure to tap into the benefits of Virtual Desktop Infrastructure (VDI). Yet workstation-caliber users have largely been left out this technological progress. Why? Because while conventional VDI implementations can sufficiently handle simple, text-centric I/O, it's woefully inadequate to manage the complex, high-resolution 2D and 3D visuals workstation users rely on ... precisely the type of content the PCoIP Remote Workstation solution was designed to deliver. Enterprises looking to extend the VDI use case to their workstation users can now leverage PCoIP technology to deliver many of the same benefits, including high security, remote access, and location independence.

Ergonomics

An often overlooked benefit of a centralized computing model is ergonomics. A more comfortable working space is always more productive. And by replacing high-power, high-temperature deskside workstations in the office with remote workstations in the backroom, the workspace is cooler, quieter, and less cluttered. Those advantages are reason enough for financial service providers like Carnegie Investment Bank to transition their trading floors to PCoIP Remote Workstation technology.

A compelling alternative today ... a computing norm tomorrow

Remote visualization of complex, big-data projects is an approach whose time has come. With PColP technology the linchpin, Teradici PColP Remote Workstation solution comprises an end-to-end architecture that's rich, interactive, economical and easy to implement and manage. It separates data and display, in the process opening up a wide range of benefits: more efficient processing of big datasets, improved ergonomics, and the ultimate in security, collaboration, management and mobility ... all without sacrificing the visual experience users have come to expect from a local workstation. Offering benefits too compelling to ignore, remote visualization solutions like Teradici's PColP Remote Workstation are becoming valued arrows in businesses' IT quivers.

About the author:

With more than 25 years of engineering, marketing and management experience in the semiconductor industry, Alex Herrera is now a consultant focusing on high-performance graphics and workstations. Author of frequent articles covering both the business and technology of computer graphics, Alex is also responsible for the Workstation Report series, published by Jon Peddie Research (www.jonpeddie.com). He continues to advise companies competing in fields related to high-performance graphics and client-centric computing.

Where to find Teradici PColP products:

Teradici PColP Remote workstation card and zero clients are manufactured and sold by a range of vendor and reseller partners, including: 10ZiG, AMD, Amulet Hotkey, BOXX, Cirrascale, Dell, EVGA, Fujitsu, HP, IO Corp, Lenovo and VXL. Visit www.teradici.com/product-finder/remote-workstation-solutions for a complete list of Teradici partners and providers, along with more information on specific components and configurations optimal for your IT environment.