

Focus Solution Profile: Teradici

Abstract

Thin client solutions have been used in various forms in corporations for nearly 20 years. By distributing user access (interface devices), while centralizing the desktop computing and storage resources in the data center, desktop management costs can be significantly lowered while providing users the ability to access their desktop workspace from anywhere on the network.

However, a primary barrier to more widespread acceptance of thin client computing has been complaints from users, especially those who require high-quality graphics and multimedia performance at the desktop, that the desktop experience has not been good enough — that it is not the same as having the computing resources on (or under) their desk.

Historically, this has been particularly true for such users as scientists using visualization software, engineers using CAD/CAE software, game developers, and video editors. With Microsoft's recent Windows Vista release with "Aero Glass," which relies on high-capability graphics, even back-office users will require a boost in graphics capabilities or suffer a degraded experience.

Teradici, with its new specialized chipset and PC/workstation blade delivery partners, has introduced solutions that raise the quality of the user experience to match the experience on a local desktop, even for applications with significant graphics requirements.

This Focus profile will discuss Teradici's approach, including its solution architecture, features, differentiators, strengths, limitations, partnerships, and an overall Focus assessment of Teradici solutions.

Vendor and Solution Overview

Teradici is a fabless semiconductor company founded in 2004 in Vancouver, Canada. Its focus is on bringing an exemplary remote user experience, with high-quality graphics and video over the network, where computing resources reside in the data center — coining the term *PC-over-IP* (PCoIP).

With roughly \$34 million raised from two rounds of funding, the company came out of stealth mode in June of 2007 and started shipping product shortly thereafter to its partners IBM, ClearCube, Verari, and Devon IT. Its partners started shipping solutions in early October 2007.

The power of Teradici's technology is evidenced by these early high-profile OEM partnerships. IBM has implemented the Teradici chipset on its BladeCenter HC10 workstation blade, coupled with its CP20 workstation connection device. The CP20 is OEMed from Devon IT and supports dual-monitor displays. Devon IT also markets the same desktop connection device as its TC10, supporting dual-monitor displays.

In June 2007, Verari Systems announced its support for Teradici's PCoIP technology as the Verari Connexus Solution, consisting of its BladeRack 2 blades with the Connexus 200/400 desktop access device, supporting either dual- or quad-monitor displays. Verari started shipping its solution in the fourth quarter of 2007. In late October 2007, ClearCube announced immediate availability of its PCoIP solution, the A1410 PC Blade, which leverages the ClearCube I9400 series I/Port with quad-monitor display support.

Teradici's current solution is based on the TERA1 chipset, which includes two high-performance chips — one chip for each end of the connection: portal and host. The TERA1100 PC-over-IP Portal Processor is used in the portal (desktop side), which Teradici affectionately

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calls “the puck” for its small, hockey-puck-like form-factor.

The TERA1200 PC-over-IP Host Processor is integrated in the host (PC, workstation, or blade). These chips implement advanced graphics compression algorithms, plus I/O bridging of USB and audio, and then encapsulate the information into IP packets to be sent across the network, encrypted for data security, resulting in a 2-D, 3-D, and video user experience equivalent to a high-powered local workstation.

Architecture

The Teradici architecture has two parts: the desktop portal or access device, and the host processor. The high-level architecture is extremely straightforward and very similar to other thin client architectures (see Figure 1).

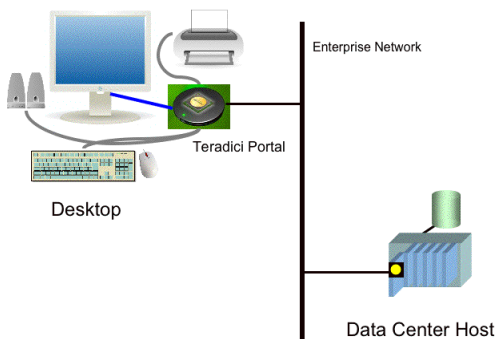


Figure 1: High-level Teradici architecture

Two Teradici chips communicate with one another — one on the data center host, the other integrated to a portal or connection device — to provide high-quality graphics and video to the desktop using the corporate network. At a lower level, the Teradici architecture is elegantly simple (see Figure 2).

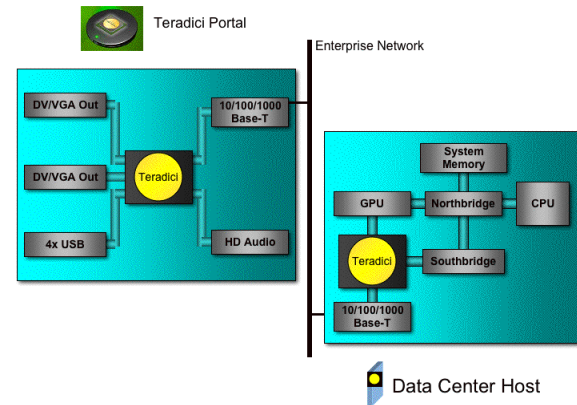


Figure 2: Low-level Teradici architecture

The host-side Teradici processor is placed in-line with the feeds coming off the high-speed graphics processor, and the USB and audio codec from the Southbridge processor (I/O controller). The Teradici processor uses advanced imaging algorithms to encode the graphics information, plus bridging techniques to package the USB and high-definition (HD) audio commands and data into IP packets to send out across the network.

On the desktop portal, the Teradici chip accepts IP packets, unpackages the data streams, and sends them to the correct device. As expected, the desktop portal also collects commands and data from all input devices (such as mouse, keyboard, and memory sticks), packages that information into IP packets, and sends them back to the host.

Technical Features

With over 30 patents filed, Teradici has a broad range of technical firsts with its solution. As shown in Figure 2, the Teradici portal chip has native support for up to two monitors per chip, for users who require multiple monitors. Quad-monitor configurations are supported using two Teradici chips per portal. Dual- or quad-monitor availability is dependent upon the OEM partner’s implementation.

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Also on the desktop portal, the Teradici solution has support for up to four physical USB ports, which are generally used for keyboard, mouse, local printer, and any other USB device allowed by the corporation.

All USB commands are processed on the host so no drivers are stored or updated on the portal device. An audio port is also available on the desktop portal, supporting high-definition audio codec.

As shown in Figure 2, the Teradici host chip is placed in the command/data path of the high-performance graphics-processing unit (GPU). This enables the Teradici solution to interoperate with any GPU supporting a digital video interface. The Teradici host chip is also in the command/data path, via PCI Express, of USB and HD audio. The HD audio supports 5.1 surround sound.

The Teradici chipset supports 10/100/1000 BASE-T networks. All network communications are encrypted at the hardware-level with 128 AES (Advanced Encryption Standard).

Differentiators

Teradici has differentiated itself in the market in a number of ways. The primary one is that it provides full high-end graphics, giving the user the feeling of no latency in the visual experience.

Having implemented its solution in hardware, it is able to gain all the efficiencies of hardware-based solutions over software-based solutions. Benefits include:

- **Working with any GPU** – Because the Teradici chip accepts a digital video feed, basically pixels, there are no interface issues. By the time the data reaches the Teradici chip, the graphics processor has already performed its work.

- **No CPU impact** – Other software-based network and/or graphics accelerators use CPU cycles, sometimes as much as 40% of the CPU. Because the Teradici chip has its own processing core, there is no need to utilize the CPU.
- **Higher performance** – The Teradici chipset sits in the data and control paths of the graphics, USB, and HD audio lines. To keep up with these feeds, the chips must perform their processing at near-wire speeds.
- **Hardware bridging of audio and USB** – Again, because the Teradici chipset is placed within the data and control path of the USB and HD audio I/O handlers, the Teradici chipset simply bridges the data and control information to be sent across a secure IP network. This enables support for any USB device from a mouse and keyboard to webcams, PDAs and 3-D motion devices.
- **Zero-client** – Unlike many other thin client devices, the desktop portal device has no drivers installed so there is no software to update or manage. Standard drivers are installed on the host, PC, or workstation blade.
- **Unlimited USB peripherals** – While a single Teradici portal chip has four physical USB connections, USB hubs can be added (either internal to the design of the portal or external) to support an unlimited number of USB ports. If the solution is using two Teradici portal chips to support quad-monitor displays, there are eight native USB connections provided by the solution.
- **Secure data path** – The fact that the Teradici solution is implemented in hardware allows for extremely fast encryption of the information being sent out on the network. A software

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implementation would not be able to provide the performance necessary to both process the data and encrypt it at the same time and still provide the level of performance the Teradici solution brings.

- **Operating-system-independent** – The Teradici solution performs completely outside the purview of the operating system. It has been tested and runs Microsoft Windows and Vista, Linux, and Mac OS, plus their applications.
- **Network perception control** – The Teradici chipset monitors the performance of the network and will optimize its processing to provide the best possible experience on the user desktop. The chipset does this, in part, by storing one frame, or one picture's worth of graphics data, on the portal.

Additionally, IT controls which USB devices are allowed to interface with the portal device on a user-by-user basis enabled by Teradici's out-of-band, hardware-based USB authorization capability.

Strengths/Limitations

The Teradici solution has many strengths, which are outlined in detail throughout this profile. Top strengths include:

- **Fast solution** – The hardware-based implementation provides a very fast IP-based solution.
- **More CPU availability** – The hardware-based solution does not place additional overhead processing on the CPUs, as a software-based solution will. This leaves more CPU processing power for computations.

The solution limitations are few, but include:

- **Virtualization support** – Today, the shipping solutions utilizing Teradici technology

require a one-to-one relationship between each host chip and each portal chip. This relationship rules out the ability to use it in a virtualized environment. It may also limit its usefulness in large Windows Vista deployments, at least in the near term, adding cost to the desktop. This limitation is expected to be overcome in the 2008 timeframe.

- **Hardware-only solutions are tied to the hardware** – This means they can't just move from one platform to another, like software can. Major updates in the product will probably mean purchasing new devices to gain the benefits of the updates. This can possibly limit the customer's choice for selecting solution vendors.

While this is not a limitation specifically of the Teradici solution, it's important to mention that, as with all network-based desktop solutions (hardware or software), network availability is always an issue. If the network goes down, this and all network-based solutions will be adversely affected. Therefore, it is extremely important, when considering any networked desktop solution, to design (or redesign) the network to handle failures and high-traffic loads by including redundancy in the design.

Focus Analysis

Seeing is believing. After seeing various Teradici solutions in action with demanding graphics applications, Focus has been impressed with the Teradici solution. It enables corporations to move their high-performance graphics PCs and workstations, plus all their associated data and management, back into the data center, providing centralized management and improved data security, even for users with the most demanding graphics requirements. For users who need this level of graphics

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performance, the Teradici solution provides an excellent user experience, while enabling IT to better manage the corporate resources. We look forward to seeing more capabilities from Teradici that will bring an enhanced user experience to a greater number of users.

About Focus

Focus delivers research, analysis, and consulting, focused on systems, software, and storage. Focus areas include server, desktop, and application virtualization/streaming; systems, storage, and enterprise management (physical and virtual); high availability, disaster recovery, and business continuity; blade systems (server, workstation, and PC); storage, network, and I/O virtualization; and storage and storage networking (NAS, SAN, Fibre Channel, iSCSI).

Focus Research Series: Desktop Delivery Alternatives

This profile is part of the Focus Research Series on Desktop Delivery Alternatives, offering insights into drivers, use cases, decision criteria, and considerations for desktop alternatives, including PC/workstation blades, virtual clients, server-based computing/terminal services, application virtualization, and streaming. For information, go to www.focusonsystems.com.

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