

TECHNOLOGY ASSESSMENT

Vendor Viewpoint: Teradici Corporation

Krista Collins

IDC OPINION

Implementing and maintaining a cost-efficient, secure, and powerful IT computing environment is a complex task. IT managers are increasingly under pressure to manage system and data security, space constraints, and maintain an increasing number of software applications and hardware devices. With traditional PCs, this can be an onerous task. Thin clients and blades are smaller, quieter, require less maintenance than PCs, and are more energy-efficient since they require fewer components. However, blade clients still require their own operating system and CPU, and without special configurations, thin clients cannot perform technical work such as scientific research, engineering development, creative graphic arts, and financial industry analysis and trading.

Teradici's solution is designed to improve PC asset management by centralizing the operating system, applications and PC components, providing enhanced security, power savings and simplified maintenance, while maintaining the power and user experience of a traditional desktop PC.

Teradici is taking a different approach to computer deployment and management, using hardware in the form of its PC-over-IP™ (personal computer over Internet protocol) Processor, instead of more traditional software solutions that are on the market to bridge the gap between host and client. Teradici's solution replaces desktop PCs with desktop portals about the size of a few stacked CDs which deliver DVI video, USB, and audio signals to the user while reducing power consumption.

To establish itself in the market, IDC believes Teradici will need to:

- Continue to partner with large PC, workstation and server OEMs, blade and thin client companies, and software companies that produce connection managers, to increase its sales infrastructure and market opportunities.
- Outpace competitors by modifying its product to address technology developments such as virtualization, WiFi (wireless fidelity), and dual-core computing.
- Continue to work with standards groups such as the Video Electronics Standards Association (VESA), to establish connections with potential partners, increase its visibility in the industry, and have an influence on the standards that will impact the adoption of its solution.

IN THIS TECHNOLOGY ASSESSMENT

In this technology assessment, sponsored by Teradici, IDC provides insight into Teradici's PC-over-IP™ Processor. IDC studies the positioning of Teradici's solution, the capabilities and applications of the technology, the size and trends of the market it is addressing, as well as its challenges and opportunities for growth. All currency figures appearing in this document are in US dollars (\$) unless otherwise stated.

SITUATION OVERVIEW

Company Overview

Based in Vancouver, Teradici provides a Host and Portal chipset solution designed to improve how computers are deployed and managed. The company's solution is called PC-over-IP™ technology and was launched in June 2007.

The PC-over-IP™ processors use specialized encoding algorithms to provide users with full PC functionality across standard IP networks, while the operating system and applications are removed from the desktop and centralized at a hosted location for better management and security. Teradici uses a hardware device about the size of a few stacked CDs at the user's desktop to encode data and then sends it to a display and USB, and audio peripheral devices. As a result, if the desktop portal is stolen or damaged, the organization's data and systems will not be compromised. The solution enables IT managers to control users' computer experiences from the datacenter, reducing operating costs that arise from managing PCs at desks, and reducing heat and noise generated by desktop PCs and workstations.

Now in operation for two years, this 55-person company has filed 28 patents, and has raised \$34 million in two venture rounds. Teradici is planning to ship its chips in August 2007, and believes the company will be profitable by next year.

Teradici's solution™ has gained the attention of IBM, which will use the company's chip on a blade card for its high-end users in markets such as manufacturing design and financial services. IBM estimates the technology will reduce its customers' power consumption from as much as 300 watts for a desktop system, down to 15 watts for the portal – a 95% reduction (Don Clark, "Now, Computing Can Handle Long-Distance Relationships," *The Wall Street Journal*, June 5, 2007). While IBM's customers previously had to be located within 200 meters from blades, the company estimates that with Teradici's chips, PC blades could now be located up to 2,500 miles from desktops. Teradici has also been working with Devon IT, ClearCube, Verari and other blade server and thin client makers that expect to sell products with the Teradici chips in 3Q07. Devon IT says that its partnership with Teradici has enabled the company to produce a solution with a true workstation experience and rich graphics. According to ClearCube, Teradici-powered technologies are the latest expansion of ClearCube's solutions that deliver end users the PC power required for their jobs. Verari says its products based on Teradici's PC-over-IP technology will offer all of the benefits of server/workstation consolidation, including manageability, security and high availability while maintaining a rich desktop experience.

Product Positioning

Implementing and maintaining a cost-efficient, secure, and powerful IT computing environment is a complex task. IT managers are increasingly under pressure to manage system and data security, space constraints, and maintain an increasing number of software applications and hardware devices. Teradici's solution enables IT managers to gain control of their IT environment by aggregating individual desktop PCs and workstations, gathering application and data storage into a single location, creating safeguards against security breaches, while improving time and efficiency for network maintenance and application upgrades.

According to Teradici, the differentiating features found in its PC-over-IP™ Processors are specialized display encoding algorithms and transparent hardware bridging technology. The TERA Portal Processor sits in the desktop portal while the TERA Host Processor is located in a blade PC or workstation stored in a secure, centralized location. The portal device is designed to be portable and free of regular IT support. With the operating system, applications and PC components stored remotely, users are equipped with a PC-over-IP™ remote portal module that is designed to be smaller, quieter and draw less power than traditional desktop PC's while still providing the benefits and user experience of a traditional desktop PC. The technology also supports dual displays on one chip and on one portal.

Teradici is currently focusing on the workstation, blade PC and desktop markets, although the company sees PC-over-IP™ applied to other markets in the future, including portable PC-over-IP™ portals in the form of tablet or notebook style devices, home media centre networking and virtualized hosted desktops.

Teradici's centralized desktop computing environment has been positioned as a solution that would be well-suited to a number of early adopters, including banks, traders, healthcare, manufacturing and design, entertainment and animation, and government. The following describes how a few of these key markets could benefit from Teradici's solution.

Financial Services: Both trading stations and banks handle sensitive customer account information and could benefit from Teradici's solution. Trading stations could isolate the system in a secure area but still provide traders with secure access to the applications. Also, simplifying seating by allowing traders and entire trading floors to locate wherever they like, instead of being fixed to a large workstation, is important for collaboration and flexibility. Trading stations could also benefit from Teradici's multiple display support. Banks would benefit from the improved customer data security and disaster recovery offered by the solution.

Healthcare: Regulations such as the Health Insurance Portability and Accountability Act (HIPAA) in the U.S. addresses the collection, use and disclosure of personal health information as well as standardization of electronic transactions. In Canada, all provinces and territories have privacy protection acts that stipulate how governments and government agencies such as healthcare facilities handle information. Ontario has a specific act, the Ontario Personal Health Information Protection Act, specifically designed to ensure the privacy of personal information. All of these regulations will drive the healthcare industry to focus more closely on securing patient data, and

solutions that can help them accomplish this will be well positioned to gain market share in this vertical.

Manufacturing: Engineers and other design professionals within the manufacturing industry rely on computer-aided design (CAD) tools and multiple displays to assist in their design activities. CAD tools use high performance graphics which traditionally require the power of large workstations to function properly. Often designers use multiple displays as well, which must be maintained by IT staff. While these existing workstations can be large, noisy, and hot, smaller and more energy efficient clients such as thin clients tend to lack the power required to handle graphically intensive technical work. With Teradici's solution, manufacturers can increase cost savings and security of their valuable CAD databases by centralizing applications and storage in a single location, while still affording users the power, functionality and full graphical experience of a PC.

Teradici's centralized computing environment has also been positioned as a solution that can address software developers' concerns around securing software code and intellectual property (IP) from theft or compromise. IDC believes that effective IP management will become increasingly important, especially with the growing interest on the part of vendors to use their IP portfolio in more creative ways such as licensing and royalty agreements (*Worldwide Software Business Strategies 2007 Top 10 Predictions*, IDC # 205135).

Technology Description

Teradici's PC-over-IP™ technology is designed specifically to deliver a user's desktop from a centralized host PC across standard IP networks. PC-over-IP™ technology incorporates specialized encoding algorithms and transparent hardware bridging for peripherals and audio to send information over the network and deliver full PC functionality to the user via a small portal. The solution removes the physical PC hardware which hosts the applications and operating system from the desktop and places them in a centralized hosted location, reducing the threat of data being affected by a virus or intrusion and improving data management. According to Teradici, the encrypted data streams provide end-to-end security and USB ports can be authorized based on device type and user profile.

The system will include a PC-over-IP™ Processor at the host PC, called the TERA Host Processor, that encodes the display, USB, and audio signals before transmitting them over an IP network (see Figure 1). A second PC-over-IP™ Processor, called the TERA Portal Processor, is located at the user's desk and receives and decodes these signals, creating standard PC interfaces for the DVI or VGA displays, USB peripherals, and PC audio. The PC-over-IP™ System is also designed to support a reverse communication path for peripherals, such as USB keyboards, mice, and microphones.

Users have three options for integrating PC-over-IP™ processors into their networks.

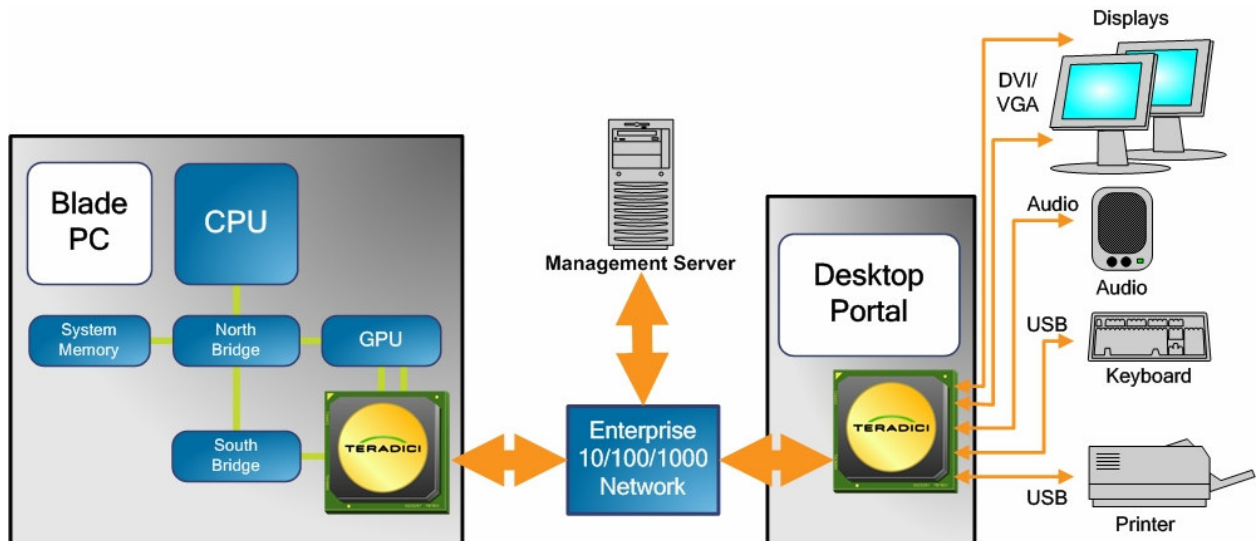
1. A blade PC module with the TERA Host processor on a daughter card
2. A blade PC with the TERA Host processor on the motherboard

3. A rack-mounted or pedestal PC with a PCI Express expansion card containing a TERA Host processor

Teradici will face a number of competitive forces as it brings its solution to market. There are vendors with products that separate the client interface from the operating system and applications. Some of these solutions use special cabling to the user's display station, which can reduce flexibility if a user needs to move from one location in the office to another. Other solutions connect the host PC to a thin client device but require licenses for the software client and server applications. There are also remote desktop protocol (RDP) enhancements or add-ons that can improve the experience and power of a thin client. Teradici will need to address these competitive forces by demonstrating its unique hardware approach to image and input/output (I/O) bridging that delivers a powerful PC experience over enterprise IP networks, without the need to run an OS on the client side.

FIGURE 1

Example of a PC-over-IP™ System for a Blade PC



Source: Teradici, 2007

Market Opportunity

Teradici's PC-over-IP™ Processor addresses IDC's blade PC and personal workstation markets, and shares some of the advantages of thin clients (see Definitions, page 10).

The pace of blade PC adoption is gradually advancing worldwide. Targeted at commercial environments, blades are gaining popularity in mature tech markets such as the US, parts of Western Europe and Japan (*Worldwide and U.S. PC Client Form Factor 2006–2010 Forecast*, IDC # 204809). Since blades are centrally managed full rack-mountable PCs, they are physically more secure and easier and less costly to manage than traditional PCs. IDC expects a sharp increase in shipments of blades in 2008, increasing to 600,000 units from 260,000 units in 2007. With the market

forecast to grow at a CAGR of approximately 146% from 2005-2010, blade shipments are expected to reach 1,957,000 units by 2010 (*Worldwide and U.S. PC Client Form Factor 2006–2010 Forecast*, IDC # 204809). Adoption in regions outside the US and new major entrants will drive growth in this market. While the growth rate for blades is impressive, unit shipments are still relatively low compared with other PC client shipments. Although IDC expects it will take time and economy of scale before blades ramp up in volume, IDC expects to see sub form factors such as blades increase in both market share and significant unit volumes, and aid in the diversification of the PC market over the forecast period.

Blades tend to provide the most value to those customers that have dense client facilities and are under pressure to manage space constraints, security concerns and maintenance costs. The military, government, financial services and some enterprise customers have been known to find value in the benefits that blade clients offer (*Worldwide PC Client Form Factor 2004-2008 Forecast*, IDC # 31058). Since Teradici's solution provides similar benefits to blade clients, these industries would likely see value in Teradici's solution as well.

While the blade market is forecast to grow rapidly over the next few years, the workstation market is a mature segment. The worldwide traditional and branded workstation shipments reached 1.9 million units in 2005, and are forecast to grow at a CAGR of approximately 10% to reach 3.1 million units in 2010 (*Worldwide Workstation 2007–2011 Forecast*, IDC # 206601). IDC expects overall shipments and revenue will continue to grow through 2010, driven largely by sales of RISC-based workstation vendors migrating to x86-64 chip architectures, and by improved performance as a result of dual-core, quad-core, and multi-core architectures. Personal workstation (PWS) shipments are forecast to grow from 1.8 million units in 2005 to over 3 million units in 2010, a CAGR of approximately 11%. This growth will come from traditional workstation users migrating to new platforms, high-end PC users looking for additional graphics capability and memory, the impact of dual-core technology, and the attractiveness of improved performance coupled with lower power consumption and heat. While traditional workstations (TWS) will continue to decline as users slowly transition to PWS, vendors will still refresh their TWS product line as many are reluctant to migrate to the PWS architecture. The TWS market is forecast to shrink from 109,165 units in 2005 to 45,349 units in 2010, a CAGR of -16%.

Although Teradici's architecture and approach is positioned differently from thin clients, examining this market highlights the opportunity for Teradici's technology. Both share similar benefit messages of increased security, better PC management, and reduced support costs. IDC has found these benefits resonate well with CIOs and IT professionals, and are now starting to be recognized as an important component of IT transformation. With the abundance of raw datacenter horsepower, wireless connectivity, client diversity and the evolution of software, organizations are rethinking how they structure their IT environments. IDC believes this will present a large opportunity for solutions such as thin clients, blade PCs, diskless PCs and other related solutions (*Worldwide Enterprise Thin Client 2006-2010 Forecast and Analysis: Stalling Out*, IDC # 204740). Worldwide enterprise thin client shipments are forecast to grow from over 2.2 million units in 2005 to over 6 million units in 2010, a CAGR of

approximately 21% (*Worldwide Enterprise Thin Client 2006-2010 Forecast and Analysis: Stalling Out*, IDC # 204740).

Teradici has targeted banks, traders, healthcare and manufacturing as a few of the early adopters for its technology. IDC believes these industries stand to benefit from the improved user experience, additional security, improved management and reduced maintenance costs provided by Teradici's solution.

Banks: IDC has found that banks worldwide continue to invest in solutions that address security and fraud management to strengthen control of nonpublic consumer and corporate information. Security, fraud management and risk are initiatives that will never be retired in banking since they are core to the protection of customer assets. While banks will spend almost \$150 billion in technology in 2007, vendors targeting banks will need to sell solutions through large technology integrators who can bundle them into solutions that can be customized to a bank's internal IT configuration (*Worldwide Banking 2007 Top 10 Strategic Initiatives: Finding New Strategies for Success*, IDC # FIN205373).

Traders: The securities and investment industry is focused on enabling employees to work remotely; enabling firms in the industry to connect with each other so that the market remains stable in the event of a disaster; ensuring that valuable data is safe, reliable, and easily accessible; and ensuring that corporate networks stay secure. Technologies that address these issues will be among the high-investment priorities (*2007 Critical Business Initiatives Driving IT: Your Industry Opportunity Guide*, IDC # 206552).

Healthcare: The inability to effectively share patient medical information between payers and providers, along with aging technology infrastructures are driving investment in a technology upgrade cycle that will make healthcare a high-growth market in the future. Patients are becoming very concerned about the confidentiality of their information, but at the same time, they are pushing for access to their records. Healthcare providers are attempting to support these needs while addressing privacy and security. Technologies that address these initiatives will be well-received in the healthcare market (*2007 Critical Business Initiatives Driving IT: Your Industry Opportunity Guide*, IDC # 206552).

Manufacturing: The tough business environment in the aerospace and defense (A&D) industry has led to constant pressure for manufacturers to cut costs and be more efficient without compromising quality (*Automotive, Aerospace, and General Discrete Industry Outlook and 2006 Budget Guide*, IDC # MI10144). While A&D firms have embraced lean manufacturing and invested steadily in information technology, they face a capacity overhang, magnifying the pressure to continue achieving productivity gains. With firms focused on improving internal efficiencies, Teradici's solution offers an attractive approach to managing the IT environment.

Within the automotive sector, manufacturers are highly motivated to streamline their organizations, automate work environments, outsource labor-intensive activities and reduce labor costs. To overcome structural cost difficulties, the industry, already heavily invested in lean principles, must continue to expand its application and look for opportunities to further eliminate waste. At the same time, power and

performance are still important. Some manufactures have upgraded their platforms to achieve higher-performance IT infrastructures and higher computing power to support demanding R&D activities such as design and simulation (*Automotive Manufacturing Industry Update, 2Q06*, IDC # MI202821). A solution such as Teradici's would enable automotive manufacturers to support demanding R&D activities, while reducing maintenance costs, heating and power consumption.

FUTURE OUTLOOK

Within the enterprise market, the plethora of remote workers has created demand from corporate IT managers for more centralized control of their wireless environment. Corporations are realizing the impact that this trend will have on support costs if they don't centralize control of the myriad of devices running various applications at the edge of the corporate network. (*U.S. and Worldwide Wireless Infrastructure and Application Services 2006-2010 Forecast*, IDC # 201872). As workers increasingly access corporate systems through a variety of devices and networks, the chance of a security breach intensifies. This fact becomes particularly critical given the security regulations that corporations are moving to comply with. The increasing activity in wireless mobility coupled with the decentralized way in which many enterprise mobility solutions have been implemented, has created a need for a greater degree of control by corporate IT departments of the enterprise wireless environment (*U.S. and Worldwide Wireless Infrastructure and Application Services 2006-2010 Forecast*, IDC # 201872). Teradici will be well suited to address these concerns by providing a solution for centralizing the operating system and applications of wireless devices, notebooks and tablet PCs, as they do with desktops. IDC suggests that Teradici partner with leading wireless device manufacturers to pursue this opportunity.

In a recent IDC study of the top concerns facing worldwide IT executives, security was the top concern for over 40% of respondents. Power consumption and cooling was also ranked in the top 5, with almost 30% of respondents listing this as a primary concern (*Worldwide Server Power and Cooling Expense 2006–2010 Forecast*, IDC # 203598). Vendors that can speak to these challenges and present solutions that address them will be well positioned to gain the attention of executives.

CHALLENGES AND OPPORTUNITIES

To expand the size and reach of its business, IDC advises that Teradici continue to partner with large PC, workstation and server OEMs, blade and thin client companies, and software companies that produce connection managers which control user administration and authorization. Teradici has already developed a partnership with one PC OEM – IBM – which plans to use the company's chip on a blade card for high-end users in markets such as financial services and manufacturing design. Teradici's chips will also be used by Devon IT, ClearCube, Verari and other blade and thin client makers that expect to sell products with the chips in 3Q07. The company's chips, which enable transmission of image and peripheral data such as DVI video, mouse, keyboard, audio, and USB between the host and the portal, will be integrated into the partners' portal devices, blades and/or workstation hardware. IDC believes

Teradici should continue developing and growing these partnerships with other PC OEMs, blade and thin client companies, and connection manager producers who stand to benefit from such a partnership by filling out their product portfolios, while Teradici would gain access to sales infrastructure and large market opportunities.

Teradici's current technology provides a one-to-one solution, or one chip on the desktop to one chip on the host. But with the advent of dual-core processing, CPUs are becoming more powerful and can manage multiple users. Teradici is now in development of a next-generation chipset that will support multiple users on a host PC. The company is also investigating how it can adapt its solution to support virtualization and wireless devices. While both initiatives would help to further reduce costs in the IT environment, Teradici must ensure users have the same experience as they do with the one-to-one model.

As Teradici refines its solution to make a greater impact on the computing environment, it is also making an impact on the development of new standards in the industry. Teradici is a member of the Video Electronics Standards Association (VESA), which supports and sets industry-wide interface standards for the PC, workstation, and consumer electronics industries. Teradici has worked with VESA's "Net2Display" task group to help standardize the bridging technology in its solution, and foster adoption of technologies such as theirs. With a membership list including IBM, HP and Dell, VESA offers Teradici a good opportunity to establish connections with potential partners, increase its visibility in the industry, and have an impact on the standards that will influence the adoption of its solution.

ESSENTIAL GUIDANCE

Teradici has developed a solution to address the growing need for control in the IT computing environment. To build market share in North America, Teradici will need to do the following:

- Continue to partner with large PC, workstation and server OEMs, blade and thin client companies, and software companies that produce connection managers, to increase its sales infrastructure and market opportunities.
- Outpace competitors by modifying its product to address technology developments such as virtualization, WiFi, and multi-user computing.
- Continue to work with standards groups such as VESA, which will help establish connections with potential partners, increase its visibility in the industry, and have an influence on the standards that will impact the adoption of its solution.

VENDOR DETAILS

Headquarters:

#500-4400 Dominion Street
Burnaby, British Columbia
Canada

V5G 4G3
www.teradici.com
Tel: 1 604 451 5800
Fax: 1 604 451 5818

Current Number of Employees: 55

Officers:

- ☒ Dan Cordingley, President and Chief Executive Officer
- ☒ Dave Hobbs, Chief Architect
- ☒ Ken Unger, Vice President, Software Engineering
- ☒ Maher Fahmi, Vice President, Silicon Engineering
- ☒ Sam Davison, Vice President Finance and Administration
- ☒ Mike DeNeffe, Vice President, Marketing and Business Development
- ☒ Joe Gorfinkle, Vice President, Worldwide Sales

Directors:

- ☒ Kevin Huscroft, Chairman
- ☒ Randy Groves, Director
- ☒ Geoff Catherwood, Director
- ☒ Andrew Katz, Director
- ☒ Joe Timlin, Director
- ☒ Kevin Fielding, Director
- ☒ Jim Noble, Director
- ☒ Daniel Rubin, Director

Go-to-market strategy: Teradici will begin selling its solution through PC OEMs in North America. The company is also working with blade and thin client vendors, as well as software connection manager vendors. Teradici is planning to expand to Europe and Asia in the long term.

Investors: Teradici has raised \$34 million in venture funding, which includes an \$18 million Series B round of financing that closed in 1Q07. Investors include Alloy Ventures, GrowthWorks Capital, Skypoint Capital, BDC Venture Capital and Alta Berkeley.

Revenue: Teradici is a privately held company and does not report revenues.

LEARN MORE

Related Research

www.vesa.org

Don Clark, "Now, Computing Can Handle Long-Distance Relationships," *The Wall Street Journal*, June 5 2007, B5.

Worldwide Workstation 2007–2011 Forecast (IDC # 206601, May 2007).

2007 Critical Business Initiatives Driving IT: Your Industry Opportunity Guide (IDC # 206552, April 2007).

Worldwide Banking 2007 Top 10 Strategic Initiatives: Finding New Strategies for Success (IDC # FIN205373, February 2007).

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Automotive, Aerospace, and General Discrete Industry Outlook and 2006 Budget Guide (IDC # MI10144, January 2006).

Alabama Automotive IT Spending 2005-2009 Forecast: Southern Hospitality (IDC # MI10054, July 2005).

Worldwide PC Client Form Factor 2004-2008 Forecast (IDC # 31058, April 2004).

DEFINITIONS

Blade clients - Blade clients, sometimes called blade PCs, are rackmountable personal computers that are designed, built, and marketed as single-user systems with a PC OS. Blade PCs provide users with low to medium processing power and software such as word processing, email and Internet browsing.

Workstations - Workstations are client computers that are specifically designed, or configured, to meet technical computing requirements and/or positioned or marketed to technical and related markets. These markets include but are not limited to scientific research, engineering development, creative and graphic arts, and financial industry analysts and traders. The two major types of workstations are:

Personal workstations - Represents the combination of PC economics with the functionality found in a traditional workstation. Personal workstations include all workstations in which Windows or Linux is the primary operating system and are based on x86 architecture processors.

Traditional workstations - Includes all workstations in which Unix is the primary operating system. Systems are built on non-x86 architecture chips, including RISC

architecture. Vendor emphasis is on technical, graphics, and networked business/professional application segments.

Enterprise thin clients - Enterprise thin clients are diskless desktop devices that exist only on a network and download applications from the server and store all of their applications and data on the server. Thin clients are also known as Windows-based terminals (WBTs), network terminals, or network computers.

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