STRATEGIC ANALYSIS OF
A REMOTE COMPUTING BUSINESS IN THE
ENTERPRISE WORKSTATION MARKET

by

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ABSTRACT

The workstation business area at Teradici Corporation is examining strategic options to grow its remote computing business over the next year. The early products introduced into the workstation market since the company launch in June 2007 have been well received by customers and partners alike. An increased rate of penetration into the existing workstation market is required to meet corporate objectives. Teradici is well positioned as a superior, differentiated remote computing solutions provider with the opportunity to become the de-facto standard in the workstation market. In order to attain this goal and increase penetration in the workstation market, it is recommended that Teradici immediately expand its product portfolio to include a mobility solution, additional multi-display solutions and virtualized workstation solutions. Teradici should also focus additional sales and marketing resources on specific workstation market segments which have had little or no penetration to date.

EXECUTIVE SUMMARY

Personal computers revolutionized business by giving users a rich and customizable application environment, which was a vast improvement over the dumb terminals that these computers replaced. However, the widespread deployment of desktop computers also created growing management and security challenges. These challenges are exasperated in the personal workstation market which requires ultra-reliable, high performance, secure, and highly specialized computing systems.

Two organizations are attempting to address the growing challenges of distributed workstation environments. HP has implemented a software based remote computing solution and Teradici has implemented a hardware based solution to address the same issue. Neither solution has yet to penetrate the workstation market which is predominantly based on distributed workstations today.

This strategic analysis provides a review of the workstation market and opportunities available for Teradici to increase its market penetration using hardware based remote computing technology. The workstation business at Teradici is evaluated to review the current market and product positioning. External market drivers including the environment and technology are examined and correlated to remote computing. The company organizational structure, strengths and weaknesses are then analyzed from an inwards perspective to set up a framework for new market and product strategies going forward.

The following options are potential routes for Teradici to reach its objective of increased penetration in the workstation market:

- o Enhance Existing Products

- o Joint Venture with Competitor

- o Increase Product Portfolio

- o Focus on Specific Workstation Market Segments

These options were evaluated against a number of key competitive and market impact criteria to evaluate the optimal strategy Teradici should pursue. It is recommended that Teradici immediately expand its product portfolio to include a mobility solution, additional multi-display solutions and virtualized workstation solutions. Teradici should also focus additional sales and marketing resources on specific workstation market segments which have had little or no penetration to date. This strategy is recommended to enable Teradici to reach the dominant position in the remote computing workstation market.

To a wonderful family

for all your patience,

encouragement and support.

ACKNOWLEDGEMENTS

I would like to offer my thanks to my project supervisors, Pek-Sooi Soh and Sudheer Gupta for their guidance and support. I would also like to thank my employer, Teradici for their support and assistance in completing this project.

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GLOSSARY

AEC   Architectural/Engineering/Construction

CAD/CAM Computer-Aided Design/Manufacturing

CIO   Chief Information Officer

DCC   Digital Content Creation

EDA   Electronic Design Automation

Fabless   A fabless semiconductor company carries out design and marketing, but out-sources manufacturing instead of operating its own silicon wafer fabrication facility

GUI   Graphical User Interface

HD   High Definition

HIPAA   Health Insurance Portability & Accountability Act

HP   Hewlett-Packard

I/O   Input/Output

IP   Internet Protocol

ISV   Independent Software Vendor

IT   Information Technology

ODM   Original Design Manufacturer

OEM   Original Equipment Manufacturer

OS   Operating System

PC   Personal Computer

PCB	Printed Circuit Board
PCoIP	Personal Computer over Internet Protocol
RDP	Remote Desktop Protocol
RISC	Reduced Instruction Set Computer
RGS	Remote Graphics Software
SOC	System on Chip
USB	Universal Serial Bus
VESA	Video Electronics Standards Association

1: INTRODUCTION

1.1 Purpose of this Strategic Analysis

The workstation business area at Teradici Corporation is examining strategic options to grow its business over the next year. The early products introduced into the workstation market since the company launch in June 2007 have been well received by customers and partners alike. An increased rate of penetration into the existing workstation market is required to meet corporate objectives.

The purpose of this analysis is to make specific recommendations regarding new market and product strategies Teradici should undertake in order to meet the corporate objective of increased penetration in the workstation market.

1.2 History of Remote Computing

Remote computing technology has evolved from the "mainframe" terminal approach used in the 1990s to thin client or server-based computing technology used today. Both technologies centre around the concept that the traditional personal computer (PC) is replaced by a terminal device or a thin client which displays applications that run on centralized servers, rather than on a local PC at the user's desk. The primary benefits of this approach to remote computing are lower information technology (IT) administration costs and enhanced data security. The full list of drivers and benefits of a centralized, server-based remote computing approach is examined in section 4.1.

The mainframe terminal approach proved to be very reliable. Users simply plugged these terminal devices into the network, logged on, and were provided access to the centralized network environment. The critical drawback with the mainframe terminal approach was a lack of the familiar desktop user interface such as the Windows or Linux graphical user interface (GUI).

Thin clients are diskless desktop devices that, like mainframe terminals, exist only on a network. When the network is available, the thin clients can be connected and used. When the network is unavailable, the thin clients are inoperative. Thin clients download applications from the server for display to the user and store all of the application and user data on the server. Thin clients use specialized software, which runs on both the server and the thin client device to transmit and receive all of the graphical display and peripheral information to and from the user. The critical drawbacks of the thin client approach are poor multimedia performance, limited peripheral support and limited application and operating system (OS) flexibility.

1.3   Teradici's Approach to Remote Computing

Teradici has developed a unique approach to solve the remote computing issue using specialized hardware chips. Teradici's PC-over-IP (PCoIP) technology is designed to deliver a user's desktop from a centralized host PC with an immaculate, uncompromised end user experience across standard internet protocol (IP) networks. To enable a rich end-user experience, the PCoIP architecture incorporates a two-chip high performance silicon solution. The PCoIP Host processor chip is included in the host PC in a centralized location. The PCoIP Portal processor chip is included in the desktop device. The term "portal" refers to the desktop client device, which is physically similar

to the traditional thin client devices described in section 1.2. The PCoIP Host processor

encodes the complete PC experience including the display, Universal Serial Bus (USB),

and high definition (HD) audio, then transmits the compressed signal over the enterprise

IP network. At the desktop end, the PCoIP Portal processor (housed in the stateless

desktop portal device) receives and decodes these signals to provide standard PC

interfaces. The PCoIP solution offers a true computing experience for the end user while

supporting the efficiency and security of centralized computing. Figure 1 shows the

components and connectivity of a PCoIP Remote Computing System.

Figure 1: Teradici PCoIP Remote Computing System
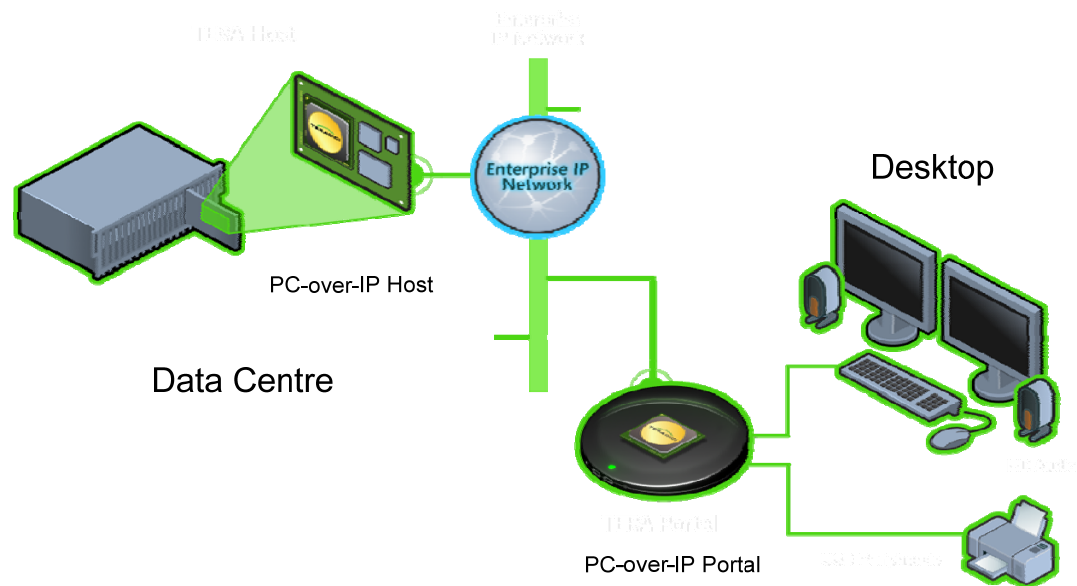
The hardware (silicon chip) based approach to the remote computing paradigm

enables the user to operate the host PC and use desktop peripherals as if the host PC were

local. The poor multimedia performance, limited peripheral support and limited

application and operating system (OS) flexibility issues introduced by the thin client

approach are eliminated when a PCoIP solution is used.

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1.4   Structure and Scope of Analysis

The purpose of this report is to make specific recommendations regarding new market and product strategies Teradici should undertake in order to meet the corporate objective of increased penetration in the workstation market, the following analysis framework is used.

Chapter 1 presents an introduction of the overall remote computing market and Teradici's unique solution for this market.

Chapters 2 and 3 provide a full review of the workstation market. A general overview including definition, segments, sizing, and growth trends is presented in chapter 2. Chapter 3 provides an analysis of the workstation business at Teradici and introduces the company's challenge in selecting new markets and products to invest in.

Chapter 4 focuses on an external, industry-level analysis. External market drivers including the environment and technology are examined and correlated to remote computing. The forces of competition affecting the workstation market for Teradici are then analyzed in terms of Porter's five-forces framework (Porter, 1980).

Chapter 5 focuses on an internal analysis of the firm. The company organizational structure, strengths and weaknesses are analyzed from an inwards perspective to set up a framework for new market and product strategies going forward.

Chapters 6 and 7 present the strategic options and recommendations that Teradici can employ to meet the corporate objective described in Chapter 1.

2: WORKSTATION MARKET OVERVIEW

2.1   Market Definition

Workstations are client computers sharing many similar attributes of a PC or mobile notebook computer. Workstations differ from a standard PC however by being specifically designed, or configured, to meet technical computing requirements and/or positioned or marketed to specialized, technical markets. Vendors emphasizing technical, graphics, and commercial applications often require a workstation to meet performance, compatibility, and reliability requirements.

These commercial applications require that workstations be 64-bit capable, OpenGL and DirectX-capable, and that the Independent Software Vendors (ISVs) provide validated software for the workstation platform. 64-bit capability is necessary because the data volumes a workstation has to handle exceed 4 GB memory space and often, 64 bit accuracy is required. OpenGL and DirectX are the standards for professional graphics and are a requirement in many commercial workstation software packages. Finally, ISVs play a big role in the definition of a workstation because the software used on the workstation is generally very complex and difficult to update. A workstation is validated by particular ISVs to ensure that the software will be compatible with the hardware and that the entire system will be ultra-stable compared to a regular PC.

Traditional workstations include all workstations in which UNIX is the primary operating system and in which the system is built on non–x86 architecture chips such as Reduced Instruction Set Computer (RISC) chips. Traditional workstations account for

less than 1% of all workstation purchases today and have been replaced by personal workstations.

Personal workstations include all workstations in which Windows or Linux is the primary operating system and are based on x86 architecture processors, the same architecture used in standard PCs. Personal workstations provide the full functionality found in earlier traditional workstations but at much more attractive prices due to the use of commodity hardware. All future references to "workstation" hardware in this report refer to personal workstations – the term "personal" will no longer be stipulated.

2.2   Market Segments

Many different market segments use workstations today for applications including scientific research, engineering development, creative and graphic arts, and financial industry analysis and trading.

Scientists use workstations for visualizing large data sets or running simulations. Architects use workstations for constructing new houses, bridges, tunnels and other buildings. Medical professionals use workstations for visualising data received from computer tomography. Geologists use workstations for cartography and oil and gas deposit explorations. The financial sector uses multi-display workstations on the trading floor to sell and buy stocks in real time and to analyze market scenarios. Workstations are also used for multimedia creation including graphic art and video production.

Table 1 summarizes the major workstation market segments and lists their primary graphical performance requirements. A description of each workstation market segment is provided, whether that market segment focuses on 2D or 3D graphics (or

both), and whether that market segment uses single, dual, or multiple displays. This

information will be used in the market and product strategy analysis in sections 4 through

6.

Table 1: Workstation Market Segments

Market Segment	Graphics Performance	Number of Displays	Description
CAD/CAM	2D and 3D	1-2	Computer-Aided Design/Manufacturing; specialized design engineering software from companies like Dassault-Systemes used in the design and manufacturing process of automobiles, aircraft, etc.
AEC	2D and 3D	1-2	Architectural/Engineering/Construction; specialized design engineering software from companies like AutoDesk; content is primarily 2D.
EDA	2D	1-2	Electronic Design Automation; design and production of electronic systems like printed circuit boards.
Scientific	2D and 3D	1-2	Complex numerical calculations require powerful workstations; visualization requires good graphical performance.
Medical	2D and 3D	1-3	Roaming, secure access to high-resolution computer tomography and other medical files strongly desired.
Government	2D	1-2	Data security, imagery and full compatibility are key drivers in sectors such as military, defence, and command and control.
Geological	2D and 3D	1-2	Data from distant oil and gas exploration sites need to be accessed remotely and available for cross-site collaboration.
Financial	2D	1-8	Multi-display workstations on trader floors, limited real estate, expensive moves, security, and disaster recover are key drivers for a remote workstation solution in the financial services sector.
DCC	2D and 3D	1-2	Digital Content Creation; dual display graphic art and video production systems are often densely deployed and could benefit greatly from centralization.

2.3   Market Size and Growth

The workstation market first gained popularity in the 1980s when the concept of high-performance, graphical desktop computing was introduced. Today, the workstation market is experiencing a healthy "second-life" with year-over-year growth expected through 2012. Figure 2 shows the worldwide workstation shipments from 2007-2012. Nearly 2 million additional workstations will ship in 2012 (4.6M) compared to the total shipments in 2007 (2.7M).

Figure 2: Worldwide Workstation Shipments Forecast, 2007-2012
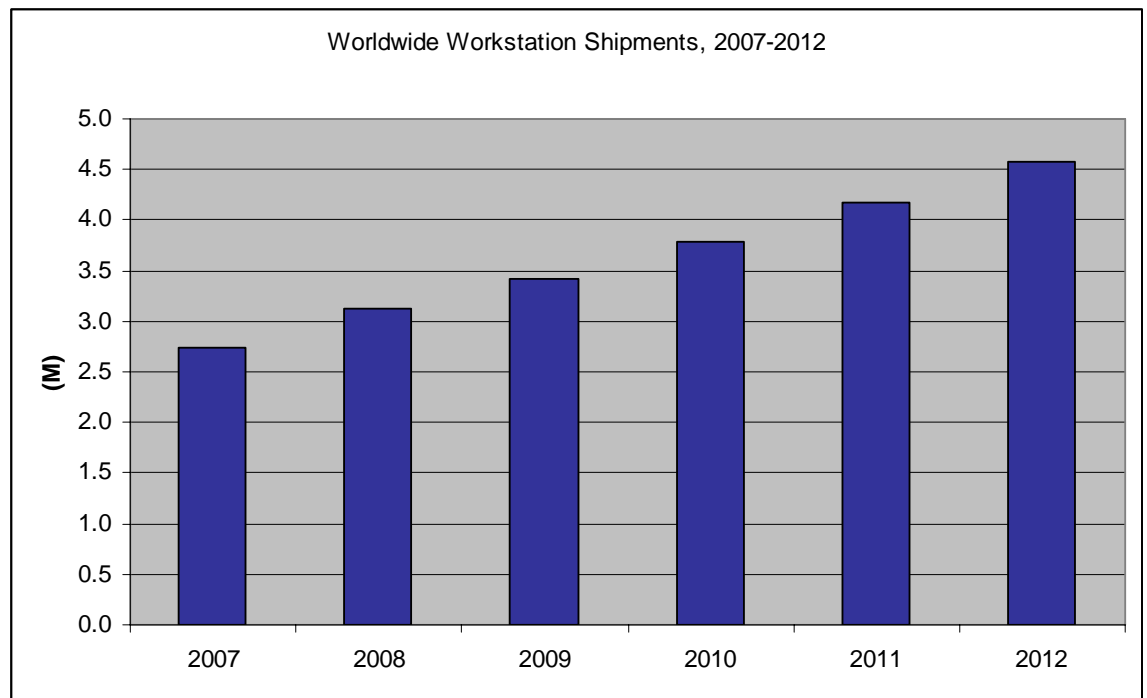
Data source: IDC, 2008

Some of the factors fuelling the growth of workstations include:

- Workloads previously performed on servers are now migrating to workstations.

- Hardware advances put 64-bit, quad core and multi-core processor architectures into the mainstream market to meet workstation performance needs.

- Increasing demands of the workstation professional including higher reliability, application-tuned performance and application-specific features.

- CAD industry "renaissance" over the last five years including a broader use of 3D techniques.

It is important to examine the worldwide workstation shipment form factors in more detail to help formulate the optimal strategy for the company. Table 2 provides a breakdown of desktop vs. mobile workstation form factor shipments worldwide. Desktop shipments refer to tower or pedestal workstations which remain stationary at the user's desk. Mobile shipments refer to notebooks or laptops with workstation class performance. These mobile workstations are often transported around the office, to and from work/home or used when the user is travelling on business.

Table 2: Worldwide Workstation Shipments Forecast by Form Factor, 2007-2012

	2007	2008	2009	2010	2011	2012
Desktop (shipments)	2,090,793	2,292,481	2,491,175	2,721,077	2,978,611	3,233,720
Desktop (%)	76.16%	73.45%	72.90%	72.03%	71.44%	70.75%
Mobile (shipments)	654,423	828,804	926,139	1,056,599	1,190,526	1,337,202
Mobile (%)	23.84%	26.55%	27.10%	27.97%	28.56%	29.25%
Total (shipments)	2,745,216	3,121,285	3,417,314	3,777,676	4,169,137	4,570,922

Data source: IDC, 2008

While desktop workstations account for the majority of shipments today, Table 2 shows that mobile workstations are gaining a larger share of the overall workstation market. This share will reach nearly 30% by 2012.

Some of the factors fuelling the growth of mobile workstations include:

- Outsourced design shops located worldwide and an increasing need for employees to travel to these remote offices.

- Disaster recovery mandates the need for full performance remote access to day-to-day employee applications and data.

- Increasing number of temporary staff hired on contract who are assigned mobile workstations to work offsite.

- Users who require greater mobility around the office.

- Managers and non-core users who require infrequent access to workstation applications or data.

3: WORKSTATION BUSINESS AT TERADICI

3.1   Current Products

Teradici has developed a two-chip silicon chipset solution and associated firmware for the remote computing workstation market. The chipset solution connects a host workstation to the remote user over a standard IP network. The host workstation is secured in a server room or datacenter and the user uses a simple, stateless desktop device called a portal to access the host workstation. To the user, the experience is just as if the workstation was located at the desk.

The chipset and firmware alone are not sufficient to have a fully functional system. The chips must be incorporated into a printed circuit board (PCB) which must then be integrated into a host workstation platform and a desktop portal device. The firmware has basic capabilities to allow a standalone remote connection to be established however, the firmware can also be incorporated into a customer's management software suite to allow for greater functionality and flexibility.

Teradici partners with several host and desktop original design manufacturers (ODMs) and original equipment manufacturers (OEMs) to integrate the chipset into PCBs and full workstation and portal products. These partnerships and associated market segment penetrations are described in the next section.

3.2 Ownership and Control History

3.2.1 Customer and Partners

Since the company launch in June 2007, Teradici has forged partnerships with a number of workstation focused customers who are shipping PCoIP enabled platforms today. Table 3 lists all announced workstation customers and identifies the primary product characteristics of each solution.

Table 3: Teradici Workstation Customers

Customer	Workstation Form Factor	Display Features	Graphics Capability
ClearCube	Blade PC Workstation	Dual Display Quad Display	Basic 3D
ELSA	PCI-Express Add-in Card	Dual Display	Extreme 3D
IBM	Blade PC Workstation	Dual Display	Basic 3D
Leadtek	PCI-Express Add-in Card	Dual Display	Extreme 3D
Verari	Blade PC Workstation	Dual Display	Extreme 3D

As the above table shows, the two form factors available from Teradici workstation customers are Blade PC workstations and PCI-Express add-in cards. Blade PC workstations contain all the main components found in a box workstation but the form factor is optimized to fit into a enclosure which normally houses several Blade PCs to optimize density, cooling, and power sharing. PCI-Express add-in cards can be added to many different host workstation platforms including box workstations, rack mount workstations, and blade servers.

3.2.2　Market Segment Penetration

The customers and products described in section 3.2.1 have enabled Teradici to make inroads into some key market segments. However, there is much more room for growth as Table 4 below identifies. The growth strategy for these market segments will be discussed in the analysis sections.

Table 4: Market Segment Penetration

Market Segment[1]	Penetration
CAD/CAM	MEDIUM
AEC	LOW
EDA	NONE
Scientific	NONE
Medical	NONE
Government	MEDIUM
Geological	LOW
Financial	LOW
DCC	LOW

3.3　Current Organizational Structure

Teradici has 80 employees most of whom are located at the corporate headquarters in Burnaby, British Columbia. Some sales and technical support staff are

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[1] The detailed description for each market segment can be found in Table 1

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located in the US. Figure 3 shows the organizational structure at Teradici with a VP or Chief Officer representing each major functional area.

Figure 3: Organizational Structure at Teradici
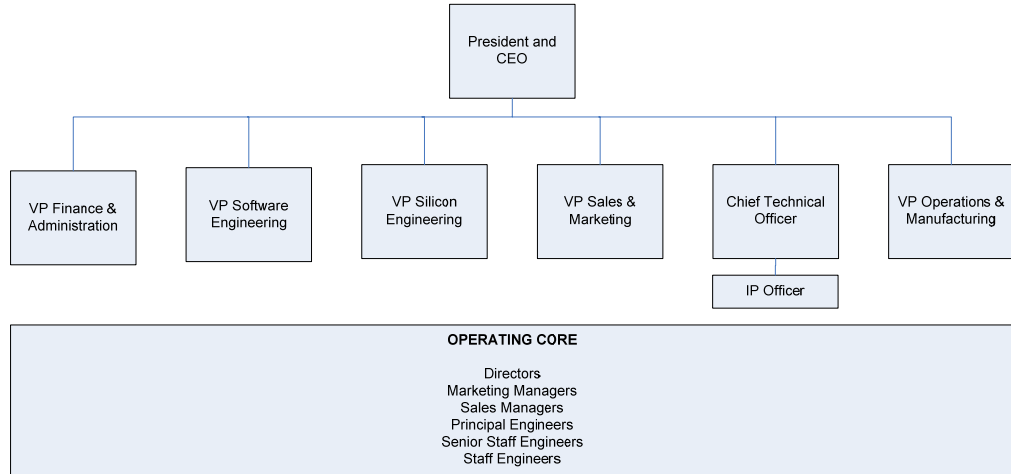
This organizational structure is has characteristics of both a simple structure and a professional bureaucracy (Mintzberg, 1981).

3.4   Workstation Business Objectives and Strategy

Section 3.2.1 highlights that only two main product form factors and display combinations exist in Teradici's product portfolio today:

1.   Blade PC workstations with dual or quad display

2.   PCI-Express add-in card with dual display

Section 3.2.2 highlights that several workstation market segments have only been partially penetrated and others have not adopted the existing Teradici solutions at all.

There are several additional form factors and display combinations which Teradici could pursue independently or through ODM and OEM customers. The

objective of the analysis in the remainder of this report is to understand if an expanded

product portfolio should be pursued and if so, which particular product(s) will result in an

increased penetration into the workstation market segments deemed most valuable to the

company. A market segment penetration strategy is also required to address the limited

penetration in key market segments identified in Table 4.

4: EXTERNAL ANALYSIS

4.1 Remote Computing Market Characteristics

IT organizations face a growing set of challenges that become more complex as user needs, software and infrastructure rapidly change. In addition, chief information officers (CIOs) are under increasing pressure to improve processes and control operating costs according to Gartner's most recent survey of over 1500 CIOs worldwide. 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:

- Easily compromised data and physical asset security

- Costly and complex moves/adds/changes of desktop hardware

- Poor reliability and availability of distributed PCs

- Complex asset management

- Power inefficiencies

- Cumbersome desktop ergonomics

These challenges open great opportunities for innovative solutions in the remote computing market. However, transforming the way PCs have been traditionally deployed for nearly 30 years also poses a significant risk if the transformation is found to be unacceptable in any way. The following sub-sections analyze the remote computing market characteristics in more detail.

4.1.1 Technological Factors

Reliability of distributed PCs is relatively poor compared to centralized high-availability systems. 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.

Asset and data security are easily compromised in a distributed PC environment. 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.

4.1.2 Environmental Factors

Physical aspects of PCs conflict with user environments in many workspaces such as those in hospitals, manufacturing plants and trading floors. These environments 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. The power and footprint savings benefits of a remote computing system are key drivers for moving away from a distributed PC model.

4.1.3 Economic Factors

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 support time. This

translates directly to higher on-going maintenance costs. Remote computing solutions can help alleviate these rising maintenance costs by reducing or eliminating regular IT maintenance. However, such solutions are generally acceptable by IT managers only when the acquisition cost parity with comparable distributed PCs is met.

4.1.4   Legal and Political Factors

Recent policies such as the Sarbanes-Oxley Act, Health Insurance Portability & Accountability Act (HIPAA) and pandemic disaster recover measures are driving IT managers towards a centralized remote computing model.

The Sarbanes-Oxley Act was enacted in 2002 in response to a number of major corporate and accounting scandals. This Act requires that public companies store and archive all financial records including unstructured and semi-structured data such as e-mail. The HIPAA Act mandates that personal health records be protected to ensure the security and confidentiality of health care information. A remote computing model where no data can be stored on the desktop device contributes to making both the Sarbanes-Oxley Act and the HIPAA Act realizable.

Disaster recovery measures have also become part of most large corporations' business continuity planning. Remote computing solutions can fulfil the requirement of quickly restoring business operations after a natural or human-induced disaster.

4.2   Forces of Competition

This section presents an industry analysis of PCoIP technology using *Porter's Five Forces* model.

4.2.1 Rivalries

The primary competitor to Teradici's PCoIP technology in the workstation market is Hewlett-Packard's (HP) Remote Graphics Software (RGS). RGS is the only commercially available solution that delivers the graphical performance required by workstation users in a remote computing environment. A secondary competitor called Remote Desktop Protocol (RDP) is briefly included in this analysis because it has achieved a noteworthy 8% adoption rate (IDC, 2007) amongst mainstream PC users and is often considered by workstation customers when they are initially looking for a remote computing solution. Various forms of RDP-enabled products are available from competitors specializing in thin client devices and PC and server hardware. RDP is classified as a secondary competitor because all products using RDP as the underlying transport protocol to connect the remote computer and the user suffer from poor graphics and multimedia performance. For this reason, very few workstation customers tend to adopt RDP for workstation-class applications. Both RDP and RGS are software based remoting solutions whereas PCoIP is a hardware based remoting solution.

4.2.1.1 Market Share and Pricing

The market size data in section 2.3 shows that 2.7M workstations shipped worldwide in 2007 with this figure expected to grow to 4.6M units by 2012. Few workstation customers have been educated about remote computing solutions such as blade workstations primarily because the technology is nascent. As a result, the penetration by both RGS and PCoIP in the workstation market has been limited. It is estimated that less than 3% of all 2.7M workstation shipments in 2007 were of the remoted type. Since the majority of the remote workstation market remains untapped and

no established incumbent has a strong foothold, the opportunity exists for remote computing solutions providers to gain early market dominance. Teradici can gain a competitive advantage by quickly winning the majority of this workstation market. However, competing with the marketing and sales prowess of the second largest PC OEM in the world is not an easy task. Teradici's PCoIP technology must be compelling enough from both a price and product differentiation standpoint to compete against HP's offering. In addition, the remote computing market characteristics identified in section 4.1 must be powerful enough to cause users to shift to a centralized computing environment.

The following table identifies the HP RGS components which must be added to a workstation computer in order to centralize it and access it remotely. The prices listed for each component were retrieved from the HP RGS web page[2] in June 2007.

Table 5: RGS Component Pricing

Component	Price ($USD)	Remark
RGS Sender Software	$899	Installed on host, could be heavily discounted
RGS Receiver Software	$0	Installed on client, distributed freely
RGS Client Computer	$850	Client computer included operating system
TOTAL	**$1,749**	

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[2]

http://h20392.www2.hp.com/portal/swdepot/displayProductsList.do?category=RGS&psn=desktops_workstations/workstation

The total price for a PCoIP host add-in card and a PCoIP desktop portal device is $800 USD. Even if the RGS Sender Software is discounted from the base price of $899 USD, the total cost of a PCoIP system is still more competitive than an RGS system.

4.2.1.2 Product Differentiation

Table 6 summarizes the features and capabilities of four different workstation solutions. The "standard PC" or workstation column summarizes the features of a regular box workstation (this is the form factor used by the majority of workstation customers today). The remaining three columns compare the PCoIP solution to RDP and RGS. Seven different categories have been identified to analyze the differences in products based on PCoIP, RDP and RGS.

1. *OS and Applications.* Are there any limitations imposed on the operating system or applications by the remoting technology?

2. *Video.* What level of video performance can be delivered by the remoting technology and what are the impacts to the host and client compute resources?

3. *Network.* How efficient is the network and encoding and how does it adapt to varying network conditions?

4. *Input/Output (I/O).* Are there any limitations on types of input and output USB or audio devices that can be used?

5. *Security.* What provisions are provided to enable a fully secure and authorized host to desktop connection?

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6. *Support.* What software or hardware maintenance is required on both the host and desktop side?

7. *Mobility and Collaboration.* Are there any provisions for mobile access of the host workstation and can collaboration among users be achieved?

As shown in the table below, the primary remote computing workstation competitors PCoIP and RGS compete in all feature categories and differentiate in some categories with respect to one another and with respect to a standard "box" PC or workstation. Table entries are colour coded to indicate how well each PC or remote computing technology meets the feature categories listed on the leftmost column. The colour breakdown is:

- o *Green.* Feature is fully supported at the highest level of performance or functionality.

- o *Yellow.* Feature is partially supported but some functionality or performance is limited.

- o *Red.* Feature is not usable, very poor or not supported at all.

Table 6: Competitive Comparison of PCoIP Technology

Feature	Standard PC	PCoIP	RDP	RGS
O/S & Applications				
O/S Independent	Yes	Yes	No	No
Application Support	Any	Any	Restricted	Restricted
Video				
3D Graphics and Media Rich Content	Full	Full	Poor	Limited
CPU and GPU Loading by Encoder	N/A	None	Varies	Significant
Client Compute Power	N/A	None	Varies	Significant
Full Frame Update Rate	60 Hz	60 Hz	Poor	Limited
Network Adaptation				
Bandwidth Saving Lossy Encoder	N/A	Yes	No	Yes
Network BW Adaptive Encoder	N/A	Yes	No	No
Lossless Image Transfer	N/A	Yes	No	No
I/O				
USB Device Support	Any	Any	Poor	Limited
USB Protocol	USB 2.0	USB 1.1	USB 2.0	USB 2.0
Audio Support	HD 5.1	HD 5.1	Stereo	Stereo
Lip-sync Audio	Yes	Yes	No	Yes
Security				
USB Device Authorization	No	Full	Limited	Limited
Desktop O/S Exposure	Yes	No	Yes	Yes
Support				
Platform Availability	Multi Source	Multi Source	Multi Source	Single Source
Desktop Device Drivers	Yes	No	Yes	Yes
Mobility and Collaboration				
Software Client	N/A	No	Yes	Yes
Collaboration	N/A	Limited	Limited	Limited

4.2.2   Threat of Entrants

New entrants to the remote computing workstation market can be grouped into
two categories: software and hardware. Entrants developing software solutions have a
lower barrier to entry than those developing hardware solutions due higher development
cost and functionality risk in the hardware business. For example, Teradici's hardware
based chip solution took over two years to develop, manufacturer, and validate before it
could be shipped in any customer platform. Had a critical error been found in the silicon
chip after the manufacturing step, the cost and schedule impact to fix the error and
manufacture a new chip would be significant (millions of dollars and up to a year of
schedule impact). Therefore, both HP and Teradici could be faced with new entrants in
their markets, especially those who can quickly develop software based solutions. To

deter such entrants, the existing players in the market can seek to quickly gain the majority of the workstation market share by winning large, high profile customers as soon as possible. The threat of a competitor developing a hardware based silicon solution similar to Teradici's and entering the workstation market is very low due to the large investment, large risk nature of the semiconductor design industry.

Relative to the mainstream PC market, the total addressable market for enterprise workstations is small so the use of first-mover's advantage to gain the dominant share in the workstation market is key. Another method to deter entrants from introducing competitive solutions is to take steps to protect the intellectual property developed by the existing companies. Remote computing at the workstation level requires the implementation of complex image compression and processing algorithms to transfer the still and moving images from the host workstation to the user in high quality. These algorithms can be aggressively protected by the filing of patents.

4.2.3 Competition from Substitutes

The primary substitute in the remote computing workstation market is the standard "box" workstation itself. Box workstations, like mainstream PCs become more and more affordable each year as performance increases and hardware prices decrease. The commoditization of workstation hardware means that traditional box workstations will continue to be competitive substitutes for new remote computing solutions.

Another possible substitute to purpose built remote computing solutions like RGS and PCoIP may be developed by the graphics processor manufacturers like NVIDIA and AMD. Today, these graphics devices are required by the RGS and PCoIP remote

computing solutions to generate the images that will be transmitted to the remote user. However, the graphics processor manufacturers may decide to include the remote computing technology within the graphics processor itself. These companies already have the graphics expertise and the manufacturing experience to do so.
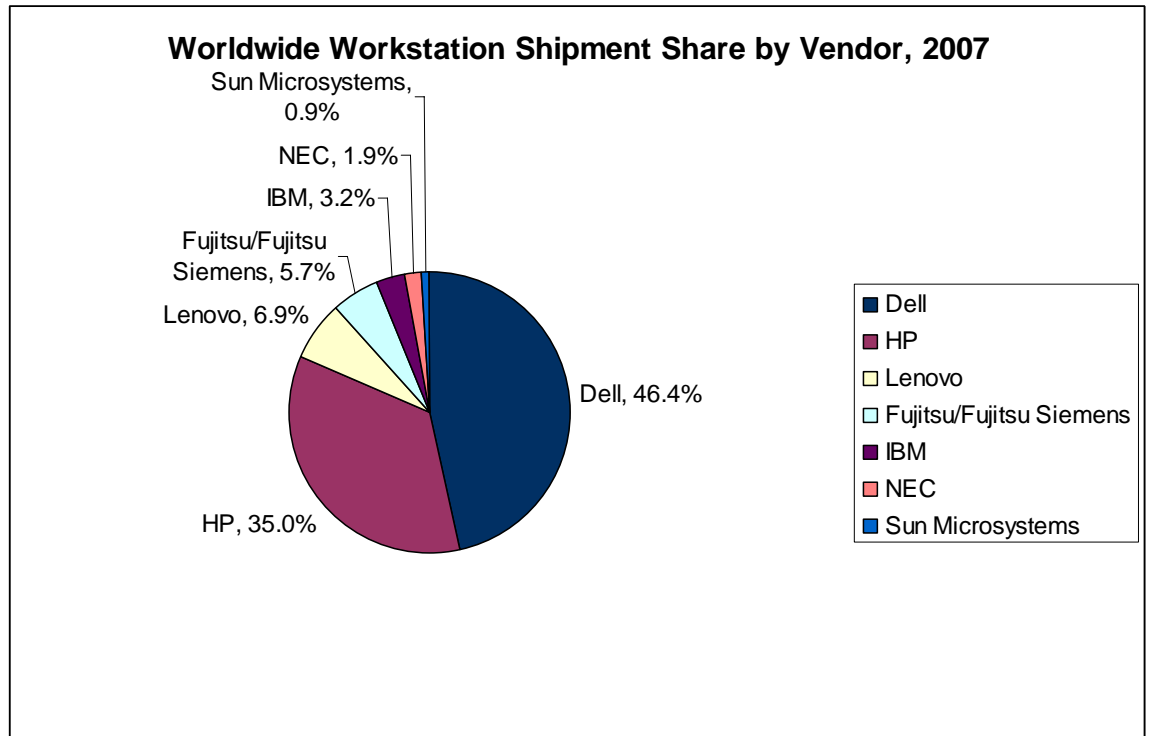
4.2.4 Power of Suppliers

Today, Teradici is the only fabless semiconductor company developing silicon chips targeted towards the remote computing market. The suppliers for Teradici PCoIP based products are those providing the manufacturing and packaging of the silicon chip as well as suppliers of periphery components which are included on the host and desktop PCBs incorporating the PCoIP chip. These *hardware* suppliers are mutually exclusive from the suppliers for the HP RGS *software* based solution so there is no direct supplier bargaining power in this scenario. However, because the remote computing workstation market is still in the early stages of adoption, high volume shipments have yet to begin. Therefore, suppliers are not yet motivated to provide the most competitive prices on manufacturing services or components used in the assembly of the host and desktop products. In this sense, the suppliers have a bargaining power advantage.

4.2.5 Power of Buyers

The workstation market is dominated by two main buyers: Dell and HP. Dell and HP own 81.4% of the workstation market as shown in Figure 4. This automatically provides Dell and HP with the greatest buyer bargaining power. Other PC OEMs including Lenovo, Fujitsu/Fujitsu Siemens, IBM, NEC and Sun Microsystems comprise the remaining 18.6% of the vendor market share.

Figure 4: Worldwide Workstation Shipment Share by Vendor, 2007

Worldwide Workstation Shipment Share by Vendor, 2007

- Sun Microsystems, 0.9%
- NEC, 1.9%
- IBM, 3.2%
- Fujitsu/Fujitsu Siemens, 5.7%
- Lenovo, 6.9%
- Dell, 46.4%
- HP, 35.0%

Legend:
- Dell
- HP
- Lenovo
- Fujitsu/Fujitsu Siemens
- IBM
- NEC
- Sun Microsystems

Data source: IDC, 2007

The power of the major buyers Dell and HP is enormous for solutions providers looking to Dell or HP to adopt their solution. However, the situation becomes complex because the second largest buyer (HP) in the workstation market currently uses their own technology (RGS) to address the remote computing demand. HP is not incentivized to adopt the competitor's solution (Teradici PCoIP) unless HP determines that they are loosing significant market share to Dell or other buyers and that this loss is attributable to an inferior product. This scenario is precisely what Teradici should focus on in order to win HP as a buyer.

A decision by Dell to use Teradici products in their workstation product line immediately provides a total available workstation market of 46.4% to Teradici. Proving to the industry and to end-users in the workstation community that a Dell workstation

solution based on Teradici technology is superior than an HP solution based on RGS will

reduce the buyer power that HP currently has.

5: INTERNAL ANALYSIS

5.1   Organizational Culture

Teradici is an early stage fabless semiconductor technology company which has grown quickly from a few employees in 2004 to over 80 employees in June 2008. The company's management and engineering staff includes veterans from companies such as Intel, Broadcom, PMC-Sierra, DELL and NVIDIA. The diverse management and technical background at Teradici allowed the company to blend semiconductor, networking, graphics, signal processing, and firmware development expertise to develop a truly disruptive product and introduce it into the enterprise workstation market.

The culture at Teradici is embodies teamwork, communication, innovation, and dedication to the technology, market and customer. The staff is accustomed to rigid documentation and process from previous experiences at semiconductor and software development companies. Regular meetings are held with team members of each cross-functional group and monthly all-hands meetings are organized to keep the entire organization informed on the latest progress and market updates.

Teradici also benefits from a valuable set of board of directors and advisors whose members' deep collective experience spans the semiconductor, networking, PC, graphics and finance industries.

5.2 Strengths

5.2.1 High Performance Silicon and Firmware Design Expertise

Teradici was founded and is managed by experienced veterans of the semiconductor industry, each of whom led successful business initiatives and product developments at many of the world's leading semiconductor companies. The engineering team has an extensive background in deep sub-micron chip design and verification for large system-on-chip (SOC) products. The company reached its goal of first silicon success when the first product was released to production in August 2007.

The SOC firmware team at Teradici incorporates expertise from staff with background in networking, graphics and embedded signal processing. The firmware team leverages all of the features implemented on the silicon device and provides a means for third party software management tools to integrate the PCoIP remote computing technology and add additional functionality and value.

5.2.2 Superior Network Delivered Graphics Capability

Teradici has developed a breakthrough innovation in computer display compression and low latency propagation algorithms to deliver a true PC experience over standard IP networks. PCoIP technology enables a rich user experience while minimizing network resources required. These two attributes are key differentiators from the competition.

No other remote computing technology has been able to achieve full graphics, peripheral and audio performance which looks, feels and sounds just like the original PC experience users are accustomed to on their box workstations. This technology includes

fully lossless static images (the remote static image is pixel-for-pixel identical to the local image) which is a key requirement for workstation users. Also, the purpose built silicon technology allows full frame rate display of graphics at the remote display. Full frame rate graphics allows remote users like design engineers to rotate complex CAD models in real-time with no perceived lag.

During times of periodic network congestion, the PCoIP algorithms will dynamically adjust to avoid any short term degradation in the user experience. This feature is also unique to PCoIP technology, is not supported by its competitor and is critical for large scale network deployments when bandwidth is shared across the corporate user base.

5.2.3   Widespread Engagement with Customers, Analysts and End Users

Teradici is working with several major enterprise workstation customers, analysts and end users. Large and influential customers like IBM have adopted Teradici's technology which is a positive endorsement for the company and the products. Forging early partnerships with customers large and small is critical. Early engagement with customers means more market and technical requirement feedback for the company. This increases the chances that products will be designed with marketable features. Therefore, it is essential to create and embed a process which allocates the necessary engineering, marketing, sales, and applications resources to creating and maintaining partnerships with customers. These processes are in place at Teradici and have been successful in creating valuable partnerships. This activity coupled with pro-active engagement with analysts and press has generated a market appreciation for Teradici's unique remote computing technology. For example, during Teradici's corporate launch

in June 2007, the Wall Street Journal highlighted the company's PCoIP solution and its customer partnerships in the Business Technology section of the paper.

Teradici invests in direct engagement with end workstation customers in the market segments identified in Table 1. While these end customers will not buy products from Teradici directly, it is important to establish direct relationships for a number of reasons. First, end customers provide "real world" requirements and candid feedback on the proposed technology which can be useful for customer support and product roadmap activities. Second, providing education about the technology and products to end users increases the awareness in the market as end users often share a community of contacts within their own market segments. Finally, direct engagement with end users helps gauge the interest level in the technology and provides an understanding of where the company lies on the competitive landscape.

5.2.4 High Level Interest from Investment Community

Teradici has gained the interest of US, Canadian and international investment firms who are looking for new technology to pave the way towards true desktop consolidation. Desktop consolidation and virtualization are top of mind topics for CIOs today. Thin clients have existed in the market for many years and have only achieved a limited share of the desktop PC or workstation market due to the issues mentioned in this report. IT organizations are still faced with the need to consolidate desktops and are now looking for new technologies to deliver full desktop experiences remotely. As a result, investors are looking for new technologies like PCoIP which they can support and promote.

Teradici is also attractive to investors because it features many of aspects of a young fabless semiconductor startup with solid prospects for growth: a large evolving market, Tier 1 customer traction, difficult and defensible technology, multiple patent filings, and a committed world class team with a history of delivering world class products.

5.2.5 Investment in Intellectual Property Protection

Fabless semiconductor companies are often also known as IP firms, because their primary product consists of licenses in patents, trade secrets, mask works, and other forms of intellectual property. Teradici has had dedicated IP and patent resources working full time since the company's inception to ensure that all of the innovative IP is properly documented and protected by patent filings.

5.2.6 Active Participation in Professional Organization

Another important area for early-stage fabless semiconductor organizations is partnerships with technology bodies. Standard bodies, technology consortiums, and other professional organizations are driven by their members. By committing resources and creating a company culture which values alliance partnerships, the organization is kept well informed and has the opportunity to influence technology advancements and standards. Teradici participates in several professional organizations including the Video Electronics Standards Association (VESA) Net2Display, a group recently organized to focus on remote computing solutions over IP networks. Teradici's Chief Architect is the co-chair of this organization.

5.3   Weaknesses

5.3.1   Limited Development Resources

A privately funded startup has a finite amount of funding available to develop and market their products and cover all operating costs including employee wages and benefits. Additional funding can be obtained through subsequent financing rounds although this funding is generally allocated to support incremental staffing and product growth. Teradici is a privately funded technology startup firm which has raised a total of $34M in two rounds of financing over the past 4 years.

With a finite amount of available funds, new product development, existing product updates or growth in staffing must be carefully evaluated. Teradici has to be selective in the market segments it decides to pursue, the number and type of products it develops and the number of people it hires. Teradici does not have the luxury that other established, or publically funded firms with healthy cash positions have. These firms can quickly increase employee headcount, product development investment and marketing and sales activities to gain a competitive advantage.

5.3.2   Mobility Solution Void

Table 2 in section 2.3 provides the breakdown of workstation shipments by form factor (desktop and mobile). This data shows that mobile workstations are gaining a larger share of the overall workstation market each year. The share in 2007 was 23.84% and this will reach nearly 30% by 2012. In order to gain access to the total available workstation market (desktop and mobile), a remote computing solution for mobile users must be offered. Without this offering, Teradici is excluded from the mobility share of the workstation market but is also at risk of losing access to some of the desktop market

share. Some IT organizations prefer to source a solution from a single vendor and/or using one remoting technology. Therefore, it is possible that Teradici may be completely designed out of a customer desktop opportunity simply because a mobility solution is unavailable.

Graphics companies like NVIDIA are delivering high performance graphics cards for notebook and laptop workstations. These cards are now capable of supporting advanced visual computing for designers, engineers, and scientists who demand the functionality of a desktop workstation on a notebook platform. PC OEMs like Dell are using these graphics cards to deliver high performance notebook workstations.

As the mobile workstation market grows each year and as the graphics capabilities of mobile workstations increases each year, more workstation users will begin to use this form factor for greater mobility. Developing a mobile strategy for remote computing users in the workstation market is now paramount.

5.3.3 Limited Multi-Display Solution

Based on interviews with IT firms in the financial sector, approximately 500,000 trader workstations exist worldwide. Trader workstations are characterized as having multiple displays (2, 4, or more), mid-range graphics performance and minimal real estate at the trader desk. In addition, traders are constantly moving from one desk to another desk or to another office location multiple times per year. For these reasons and the reasons identified earlier in section 4.1, trader workstations are prime candidates for centralization using a remote computing solution like PCoIP or RGS.

Relative to the total available workstation market size of 3M (in 2007), 500,000 trader workstations represents a significant opportunity for Teradici. Traders demand the latest IT technologies and are generally less price sensitive than the other workstation markets due to the high profile, high profit, fast-paced nature of a trader employee position.

Today, Teradici has one OEM partner who provides a quad display trader solution focused directly at the financial services market. This quad display workstation meets all of the performance and usability requirements of the trader and continues to be well received by trading floors on Wall Street and worldwide. However, some customers have existing relationships with other workstation OEMs or are looking for a more flexible solution which can be retrofitted into their existing datacenter hardware. These customers will be less likely to transition to a Teradici solution until additional multi-display workstations are available from other OEMs or in an "add-in" fashion which allows them to retrofit existing hardware.

5.3.4 No Virtualization Support for Workstation Users

Hardware advances have resulted in the wide availability of 64-bit, quad core and multi-core processor workstations. The majority of the workstations on the market now fall into a price band of less than $3000 USD (IDC, 2008). IT organizations can now afford to purchase the highest performance workstation for their users. In some cases, these workstations are underutilized by one single user. By sharing one workstation with multiple users, IT organizations benefit from reduced hardware acquisition costs. This has created a new market demand for virtualized workstations. It is important to note that only some workstation users are candidates to use virtualization. The majority of

workstation users will still require a dedicated workstation to avoid any degradation in performance and productivity.

Virtualized workstations are workstations which can be shared by two or more users concurrently. Virtualization can be enabled using a software only approach or it can make use a hybrid hardware/software approach for better performance. In either case, virtualization software vendors must provide components needed to deliver workstation class virtualization. Virtualization software vendors are currently developing some of these components and Teradici has partnered with these vendors to prepare for the enablement of virtualization. Teradici is also developing technology to enable a hybrid hardware/software approach for virtualized workstations but does not currently have a product available on the market.

6: STRATEGIC OPTIONS

This section of the analysis uses the workstation and remote computing market material as well as the external and internal analysis evaluations to present a set of options for Teradici to reach the goal of increasing penetration in the workstation market.

Teradici faces a unique competitive situation characterized by:

- Only one primary competitor (HP RGS)

- The primary competitor is also the second largest workstation vendor by market share (and therefore the second largest potential buyer of Teradici technology)

- An incomplete product portfolio which is limiting large scale adoption of PCoIP technology

- A limited set of development resources within the constraints of a privately funding startup company

Conversely, Teradici benefits from the following market and technology characteristics:

- Superior graphics remoting technology

- A competitive pricing offering vs. the competition

- A healthy and growing workstation market

- Tier 1 OEM customer traction

- Difficult and defensible technology with multiple patent filings

The challenge is to use the above benefits to outpace and outperform the competition while satisfying the product and functionality demands that are limiting adoption in the workstation market today. The following options suggest different ways that Teradici can address these challenges and increase penetration in the workstation market.

6.1   Enhance Existing Products

The existing products summarized in Table 3 can be enhanced by adding new functionality using firmware or software. The advantages of developing updated firmware or software is that the hardware products already available from Teradici customers can be easily upgraded to enable new functionality. The disadvantage is that firmware or software updates can only provide a limited set of new features and the performance improvement is often minimal or even degraded.

A review of potential firmware and software updates with the product and engineering teams at Teradici identified several new features which could be added to existing products. While these features would enhance the functionality of the existing products, most would not be able to address the weaknesses specific to the workstation market and described in section 5.3. The firmware and software enhancements may allow Teradici to gain traction in new markets outside of workstation, but these enhancements will not meet most of the unfulfilled requirements of the workstation users today.

6.2   Joint Venture with Competitor

Teradici faces a very unique competitive situation today in that the primary competitor (HP) is also the second largest workstation vendor by market share. Dell owns 46.4% of the workstation market and HP owns 35% of the workstation market. To gain a majority of the total available workstation market share, Teradici must win both Dell and HP as workstation customers. Dell does not offer a remote computing workstation solution today and the strategy to win this customer is relatively straightforward. Conversely, HP offers RGS, Teradici's only remote computing competitor in the workstation market and a unique strategy must be developed to win this customer.

HP's RGS technology and Teradici's PCoIP technology are different solutions to a common problem: enabling desktop centralization in the workstation market. Each technology has unique advantages and disadvantages. These have been identified in Table 6. One model that would allow both HP and Teradici to expand their reach into the workstation market is by working together on a joint venture. There is an opportunity to combine some of the technology developed by HP with some of the technology developed by Teradici. The benefit to HP would be that it gains access to new remote computing technology and is in a position to provide an enhanced product. The additional benefit to Teradici would be that it gains access to HP's workstation market share.

6.3 Increase Product Portfolio

By increasing its product portfolio, Teradici can address the unfulfilled requirements of the workstation market, most notably those requirements identified as weaknesses in section 5.3: mobility, multi-display and virtualization.

Providing a mobility solution will immediately increase Teradici's total available market share by 25-30% over the next four years. A mobility solution will allow IT organizations to deploy mobile workstations (notebooks) which provide the same remote computing benefits explained in section 4.1 but with the added mobility benefit. Workstation users will be able to move to different locations around the office such as conference rooms and still have access to their data in a high performance fashion.

Providing additional multi-display solutions will immediately increase Teradici's reach into the financial services market, especially within the sub-segment deploying trader workstations.

Providing a workstation virtualization solution will make it more attractive for IT managers to move towards a centralized computing model as they would benefit from shared hardware resources and reduced operating costs. Even if IT organizations are not comfortable adopting a virtualization solution today (due to limited host performance or premature virtualization components), providing the option or a roadmap towards virtualization will also make the centralized solution more attractive for immediate non-virtualized adoption.

Increasing Teradici's product portfolio in the mobility, multi-display and virtualization categories will address key remote computing aspects which are unavailable today and strongly desired by workstation IT organizations. However, it has

already been identified in section 5.3.1 that Teradici has limited development resources and funding. Developing three new products simultaneously will be too onerous on the organization. Instead, Teradici should investigate the option of reducing the development down to two products. A mobility solution will be very tailored and purpose built for a mobile form factor while multi-display and virtualization solutions are targeted towards a common non-mobile form factor. It is recommended that only two products be developed: (1) a mobility solution and (2) a single solution which features two modes: multi-display or virtualization.

6.4   Focus on Specific Workstation Market Segments

In Table 4, each workstation market segment was given an associated penetration rate in the workstation market (none, low, medium). While it is important to continue to support those segments with medium penetration like CAD/CAM and government, special focus must be afforded to those segments with low or no penetration.

The workstation market is growing at a healthy rate but this rate is only incremental due to the very specialized nature of workstation usage. With only incremental year-over-year growth, it is important for Teradici to penetrate into every available workstation market segment to reach the largest possible overall penetration rate. Losing even one market segment could result in a double-digit percentage loss in the total available workstation market.

Some avenues Teradici can employ to focus on the segments with low or no penetration (including AEC, EDA, Scientific, Medical, Geological, Financial and DCC) are:

- Increase in direct end-user engagement in low or no penetration rate market segments

- Organize directed promotional activities like demos and tradeshows in specific market segments with low or no penetration rate

- Partner with workstation customers who have pre-existing relationships in market segments with low or no penetration

- Deliver new products or product updates with features specific to market segments with low or no penetration (e.g. multi-display product for financial services market segment)

7: RECOMMENDATIONS

7.1   Evaluation Criteria

The strategic options presented in section 6 are captured and evaluated against specific criteria in Table 7 below. If achieved, each of the criteria selected for the evaluation of the strategic options will contribute to the overall goal of increasing penetration in the workstation market.

- *Reduce Competitor Market Share.* As indicated in the external analysis, the majority of the remote workstation market remains untapped and no established incumbent has a strong foothold. Therefore, the opportunity exists for Teradici to gain a competitive advantage by quickly reducing the competitor market share and winning the majority of this workstation market.

- *Access to HP Workstation Market Share.* Teradici's primary competitor (HP) is also the second largest workstation vendor by market share. To gain a majority of the total available workstation market share, Teradici must win HP as a workstation customer.

- *Address Mobility, Multi-display, and Virtualization Demand.* By providing an expanded product portfolio tailored towards the needs of the workstation users, Teradici will be in a position to win the majority of the workstation customers.

- *Increase Sub-segment Market Penetration.* This criterion is important in order for Teradici to gain access to as many sub-segments as possible and achieve a dominant position in the remote computing workstation market

- *Maintain a Sustainable Competitive Advantage.* For Teradici to be successful and become the dominant de-facto standard in workstation remote computing technology, it requires a sustainable competitive advantage.

Table 7: Strategic Options Impact Matrix

	Enhance Existing Products	Joint Venture with Competitor	Increase Product Portfolio	Focus on Specific Market Segments
Reduce Competitor Market Share	✖	✓	✓	✓
Access to HP Workstation Market Share	✖	✓	✖	✖
Address Mobility Demand	✖	✖	✓	✖
Address Multi-Display Demand	✖	✖	✓	✓
Address Virtualization Demand	✖	✖	✓	✖
Increase Sub-segment Market Penetration	✓	✖	✓	✓
Maintain a Sustainable Competitive Advantage	✓	✖	✓	✖

7.2   Strategic Recommendation

Each of the strategic options identified in Table 7 allows Teradici to meet some of the criteria identified as required to increase penetration in the workstation market. The option which meets the most of these criteria is for Teradici to increase its product portfolio. Focusing sales and marketing efforts on specific market segments will also enable widespread reach across the workstation market and meets many of the criteria established above.

It is recommended then that Teradici immediately launch two projects to increase its product offering for the workstation market:

1. Teradici should launch a mobility solution project targeting mobile workstations which can benefit from all the characteristics of remote computing. This will ensure that Teradici does not lose on a 25-30% available market share as mobile workstations become more and more popular.

2. Teradici should launch a multi-display and virtualization project targeting financial services users requiring four or more displays as well as mid-range workstation users who's performance requirements are low enough that they can share a virtualized workstation with at least one other user. The hardware solution which is developed should support both multi-display and virtualization requirements on one hardware platform to minimize development costs.

In addition to the above product line expansion recommendation, Teradici should also allocate more sales and marketing resources to the specific workstation sub-segments that have reported a low or no penetration rate.

The remaining two options to enhance existing products or embark on a join venture with the competitor should not be pursued unless additional development resources, funding or business opportunities become available.

7.3   Implementation Plan

In section 5.3, limited development resources was identified as a hurdle that Teradici faces relative to its competition. A privately funded startup company must allocate resources and budget available funds carefully in order to meet the primary objective of generating revenue and reaching profitability. For this reason, only two of the four strategic options identified were recommended for implementation.

The first option recommended for Teradici was to launch a mobility solution project to target the 25-30% of mobile workstation users who are not in a position to use traditional fixed workstation platforms. A mobility solution requires a different skill set and a new architecture due to the unique form factor and characteristics of a notebook versus a fixed workstation. Rather than focusing internal resources and funds to develop expertise in mobile notebook designs, Teradici should partner with an independent mobile notebook firm to limit the impact on internal resources. A combination of Teradici developed remote computing technology with third party mobile notebook design knowledge will result in an accelerated product development cycle. Careful consideration must be given when selecting the mobility solution partner to ensure that

this partner is in a market position to meet the majority of the 25-30% mobile workstation user base.

The second option recommended for Teradici was to increase its product portfolio by launching multi-display and virtualization solutions targeted directly at financial services and mid-range workstation users. Optimizing the use of development resources in this case is also important in order for both multi-display and virtualization solutions to be successfully completed. Teradici should target a flexible hardware development platform which can accommodate both multi-display and virtualization solutions on the same PCB. This will enable the most optimal use of the limited development resources.

The specific product requirements, physical characteristics and implementation details for the mobility and multi-display/virtualization projects recommended in the previous section are not included as part of this recommendation. It is suggested that the product marketing and engineering teams begin investigating the detailed requirements and implementation details immediately using the strategic guidance included in this report.

The current research and development staffing level is estimated to be sufficient to implement the product portfolio expansion strategy described above. However, there is a risk that the mobility solution may consume more resources than anticipated if an appropriate mobile notebook partner is not secured and/or if Teradici has to undertake the majority of development effort. It would also be valuable for Teradici to pursue the remaining two strategic options of enhancing existing products and embarking on a joint venture with the competitor to further increase the chances that the firm will secure a dominant position in the workstation market. For these reasons, Teradici should begin

planning a follow-on funding round to allow the firm to pursue the recommended strategies and the remaining two strategies in full rigour.

7.4   Conclusion

Workstations remain a vibrant piece of today's IT landscape, and those vendors with both the tenacity and foresight to invest in the market continue to be rewarded. With a large evolving market, Tier 1 customer traction, difficult and defensible technology, superior and differentiated performance, multiple patent filings, and a committed world class team, Teradici is well-positioned to becoming the de-facto standard for remote computing in the workstation market.

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