

## Thin Client Technology White Paper



Increasing Control and Reducing Costs with Thin Clients

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## Executive Summary

Thin Client is an industry accepted standard achieving significant savings over the cost of traditional PC's. Thin Client technology is essentially PC's without local and removable storage. This simpler model affords many advantages to the enterprise including lower acquisition cost, lower maintenance cost and better security.

A major force behind the move to Thin Client computing is lower Total Cost of Ownership (TCO), as compared to other desktop alternatives. Although it is difficult to measure all of the indirect cost saving opportunities in Thin Client technology, versus the traditional PC environment, it is a proven fact that Thin Client computing offers significant direct savings. While TCO is a key reason for the conversion to Thin Client computing, there are numerous other reasons, which will be discussed in more detail in this paper.

This paper provides an introduction to Windows Terminal Services, Thin Client and Server-based Computing. This paper presents what industry analysts report and their projections on the future for Thin Client computing.

The following topics are covered:

- | What is a Thin Client?
- | What is Server-based Computing?
- | What are the Primary Computing Models?
- | What is the necessary software?
- | What are the benefits of Windows 2000 Terminal Services?
- | What about hardware? Can existing computers (PC's & Mac's) be used as Thin Clients?
- | What are the advantages of Thin Client computing?
- | How does Thin Client technology affect IT Management?
- | What about productivity in the office environment?
- | How does Thin Client technology affect Remote Offices?
- | Are there any disadvantages to using Thin Client technology?
- | What is the average cost of a Thin Client device?
- | What are organizations seeking in a Thin Client solution?
- | What vertical markets does Thin Client technology exist in today?
- | What do the Industry Experts report?
- | What is the future?

i Who can help?

### ***What is a “Thin Client”?***

In place of a PC, Thin Client devices are simple computers designed to run applications from a central server not from the desktop PC. A Thin Client is a desktop appliance with no hard drive, floppy drive, CD-ROM, or other moving components delivering hundreds of dollars of savings per unit in acquisition and maintenance costs. It is typically a Windows-based terminal (called a Winterm); however, it can also be a Personal Computer (PC) running the Thin Client emulator or even a handheld device, such as a Personal Digital Assistant (PDA).

### ***What is “Server-based Computing”?***

Server-based Computing allows applications to be deployed, managed, supported, and executed on a single server. Only the screen updates are sent to the Winterm. This is unlike the traditional computing model where programs are stored and executed on a PC with data located on that PC or possibly located on a file server in another location.

### ***What are the Primary Computing Models?***

The following primary computing models are currently used by organizations to deploy applications.

#### **1. Non-administered Desktop**

This computing model defines an environment that users each have their own desktop system. System administrators or users manage each system individually, including the installation and upgrade of operating system and software.

#### **2. Administered Desktop**

This model allows system administrators to install and manage applications on desktops remotely and from a centralized remote location.

#### **3. Thin Client/Server-based**

All the application processing takes place on one or more centralized servers. Users can access these applications, locally or remotely, via virtually any connection using a standard desktop device, a wireless device, Web browser or Thin Client device. This model is the focus of this paper.

Typically, the non-administered model is the most costly, in regard to management cost, with the Server-based Computing model being the lowest. Most organizations employ more than one of these models, which increase overall costs. Many organizations need to support multiple platforms (Windows, UNIX, Mac), which complicates matters and increases costs.

### ***What is the Necessary Software?***

The software that is used for the Windows-based terminal solution is Microsoft Windows 2000 Terminal Services, and Citrix® MetaFrame, which uses the Thin Client protocol based on Independent Computing Architecture (ICA). The Windows 2000 Terminal Services option is included with Windows 2000. This option can be turned on during the installation of Windows 2000.

Citrix MetaFrame extends the functionality of Windows 2000 Terminal Services by providing enterprise management, Web-enablement of applications and access from any location or device, over any network connection—wireless to Web. It is necessary to add MetaFrame for Windows 2000 on top of Windows 2000 Terminal Services to permit access by other types of systems, such as Apple (Mac) or UNIX-based systems.

### ***What are the Benefits of Windows 2000 Terminal Services?***

Microsoft identifies three specific benefits from enabling Terminal Services:

#### ***1. Bring Windows 2000 to desktops faster***

Administrators face an expensive and time-consuming task managing desktop systems and software. By enabling the Application Server mode of Terminal Services, organizations can deliver a “virtual” version of Windows 2000 Professional immediately to all desktops, including MS-DOS, PC’s, Macintosh, UNIX-based machines, and others.

#### ***2. Central deployment and management of Windows-based applications to virtually any client over any network connection***

Because all applications software is deployed on central servers, Windows 2000 Terminal Services ensures that all users can access the latest version of an application. Terminal Services can deliver applications and a GUI interface across a Local Area Network (LAN), a Wide Area Network (WAN), or a dial-up connection without taking up network resources or requiring additional bandwidth. Rather than sending applications and data files across the network between server and client, all Terminal Services transmits are the screen/display commands, keyboard strokes and mouse movements and clicks. The Microsoft communications protocol, Remote Desktop Protocol (RDP) bundles data to be transmitted in small packets that run in the 20kbs range at high-performance levels. Thus, the need to upgrade network bandwidth resources are reduced or eliminated.

### **3. Remote administration of Windows 2000-based servers**

Terminal Services provides all Windows 2000 Server administrators a limited "Remote Administration" mode of Terminal Services that permits the administrator alone to administer any and all of the Windows 2000 Servers from any desktop machine, anywhere in the world.



**This photo illustrates a Thin Client**

#### **What About Hardware? Can Existing Computers (PC's & Mac's) be Used as Thin Clients?**

Because the server handles application processing and memory demands, almost any computer can function as a Thin Client. However, there are devices that are specifically designed and optimized for Thin Client protocol and offer the greatest advantages.

The network servers that use Thin Client devices should be modular and robust, with fault tolerance and have sufficient processing power, 8-24 MB of memory per simultaneous user and 64MB for the operating system.

In addition to the Thin Client devices that can sit on the desktop, Server-based Computing requires three elements:

1. An Operating System (OS) that support Thin Clients (Windows, UNIX and Linux are the most common)
2. Technology that offers IT greater control over network traffic
3. Centralized application and client-management software



## **What are the Advantages of Thin Client Computing?**

There are many advantages to Thin Client computing including lower cost, ease-of-use, reliability and security, in addition to some of the following advantages:

- A standard [Winterm](#) network *builds on existing infrastructure*, networks, servers, computing devices, and software.
- There is *reduced time* spent in troubleshooting problems and less time trying to fix and maintain computers.
- Winterns are a *fraction of the cost* of PC's as Winterns do not require a hard disk, floppy drive or require much memory (RAM).
- Winterns are *more energy-efficient* than PC's, with some models using 85% less energy than their PC rivals in the real world environment. Less energy translates into *cost savings*. (See [Energy Savings](#) for more details.)
- Winterns use the network to access data and applications from servers rather than storing information or processing power at the desktop. PC's require substantial memory and computing power.
- An optimized Winterm, with fewer moving parts and less software complexity, will function without failure significantly longer than a typical PC and *require less maintenance*. According to studies, Winterns run without failure up to five times longer than PC's and have nine times the hardware reliability of the PC. Winterns do not have to be replaced every 18-36 months due to the short product life of PC's.
- Users do not need to 'administer' Winterns and they can be *setup in minutes by anyone*.
- Winterns start in seconds rather than minutes like PC's and are *quiet, easy-to-deploy and simple to use*.
- Information can be backed up on the server instead of on all the individual PC's. This increases the probability of data getting backed up.
- The size is *small*, which improves desk space, as much of the hardware components of a standard PC are not necessary.
- It is not necessary to keep a large inventory of drives and PC's waiting for a failure to occur. If a Winterm desktop breaks, a complete replacement can be provided to bring the user back up immediately.
- *Obsolescence is greatly reduced*. The latest CPU available on the market is not necessary for Thin Client computing, while PC's, to run the latest software, often require the latest technology.

- | With Wintterms, it is not necessary to go onsite to adjust the user's desktop as all the administration is brought into the network domain. *Updates are made from a central location.* (See [Remote administration of Windows 2000-based servers](#) for more details.)
- | Even with a diversity of application programs, *the desktop is easily supported.* A Wintterm can be configured in five minutes, while a PC or workstation can be configured in 30 minutes, which is six times longer.
- | Wintterms are virtually *virus proof*, as they do not have vulnerable openings like floppy drives or CD ROMs where viruses can be introduced. Users cannot load or use 'unauthorized' software on Wintterms.
- | Wintterms have a *lower risk of equipment theft* when compared to a PC. By itself, the PC has no great value, as the processing power, memory and data are secure on the server.
- | Software upgrades, operating system and application software are done 'once' on the server, which reduces the 'down-time' for users. An estimated 95% of all pre-Windows 2000 PC's will need to be upgraded or replaced in order to run Windows 2000 Professional. (See [Bring Windows 2000 to desktops faster](#) for more details.)
- | *Network resources are preserved.* Unlike PC's that send large amounts of information such as data files to printers across the network, Wintterms send only keystrokes and screen shots. Demands for increased bandwidth are significantly lowered. (See [Central deployment and management of Windows-based applications](#) for more details.)

### *Energy Savings*

Energy costs are steadily rising with some small companies seeing prices in excess of 20 cents per kilowatt-hour. The Environmental Protection Agency (EPA) says that the typical PC uses between 50 and 100 Watts per hour. Users often leave their PC's on all day and night rather than repeatedly waiting for them to power up, which contributes further to our energy problem. Wintterms power up quickly and consumes between one-fifth and one-twelfth (7-10 Watts of electricity per hour) of the energy of PC's. Because Wintterms lack moving media and fans, they have a lower power use. Organizations with remote offices may be able to eliminate servers in those offices entirely, with still greater net reductions in electricity usage. The total power usage will vary based on the type of monitor used; however the actual power consumption of Wintterms is considerably less than PC's.

To estimate how a change in power consumption of desktop devices affects the amount of money spent each year on power: multiply the number of desktop devices by the power (in kilowatts) used by each device by the number of hours each week that the devices are on by 52 (the number of weeks in a year). It is possible to lower the power costs of the computing environment by the use of desktop monitors that consume less power; however, the

cost savings are minimal when compared to changing from a PC to a Winterm environment. It is clear that Winterns are more energy-efficient than PC's with some Winterm models using 85 percent less power than their PC rivals.

### ***How does Thin Client Technology Affect IT Management?***

Thin Client technology delivers central management of IT resources, plus faster and more frequent deployment of new applications and software. It permits remote, hands-off configuring, monitoring, and administration of desktop devices.

Network administrators maintain applications on a single server or small group of servers instead of on every desktop device. It allows access to applications from any device connected to the server without having to install the applications on each individual device. When applications are moved to the server, the increased control for the IT department brings almost immeasurable benefits in security, uniformity and data privacy.

Thin Client technology can solve some of the most troublesome problems facing IT, including data privacy and security, staffing shortage and the investment in technology purchases. It is estimated that 70 percent of a network administrator's time is spent on end user issues. Utilizing Thin Client technology allows IT personnel to devote more time to more challenging strategic work. In summary, performance capacity and desktop management issues are all streamlined, because a centralized team of IT experts can manage Winterm devices remotely.

### ***What About Productivity in the Office Environment?***

Computers can raise workers' productivity and improve the office climate. Users get themselves and the company in all sorts of trouble through unauthorized applications, downloads and errors, which results in problems for everyone. Users that are not able to access their applications due to hardware downtime are less productive, which leads to a higher cost structure. Thin Client computing can solve these problems. The users can be given the tools that they need and users have a single point of access for all their computing needs. Simply, Thin Clients help people get their work done more efficiently, which is beneficial for the individual and the organization.

### ***How does Thin Client Technology Affect Remote Offices?***

With Thin Clients, remote offices can normally be set up in hours and do not need expensive network equipment, configuration and support that is required in a distributed PC environment. A hub, router and Internet connection to the main data center enable remote offices to access the same applications, databases and network services as they do at the corporate headquarters. The support staff can shadow user sessions and troubleshoot problems remotely. Even working via a Thin Client at home through a DSL line or cable modem, users still experience application performance comparable to using a PC at the office.

### ***Are there any Disadvantages to Using Thin Client Technology?***

There are situations where PC's are a better choice over Winterm. PC's are better than Winterm for 'Power' users that need CD access, need streaming video and sound, and require applications that are not 'terminal server' friendly. PC's give their users desktop computing power and control over applications and data. However, not every desktop is best addressed with Thin Client devices. For data and graphic intensive applications, such as Computer-Aided Design (CAD), PC's are the better choice based on memory, hard drive access, etc.

### ***What is the Average Cost of a Thin Client Device?***

The average retail price of a Winterm is approximately \$500 per device. The cost over time is much lower than a typical PC due to the following factors:

- i Maintenance
- i Support
- i Upgrade costs

Of course, this will vary depending on the infrastructure that is currently in place, the number of users and the applications being used on the server. Using Thin Client devices with Server-based Computing reduces Total Cost Ownership (TCO) even more than Server-based Computing with PC's. TCO is the sum of all time and money spent on a piece of technology from purchase to disposal. It represents more than just a computer's purchase price; it represents the ongoing costs of maintaining that computer. Thin Client devices are designed to cost less than PC's to run and maintain.

The major cost components associated with deployment are:

- Loss of Productivity (because of server, desktop and network downtime)
- Desktop (this includes hardware, operating system licenses and support)
- Application Maintenance (desktop and client/server applications)
- Training

There are two types of costs.

- **Hard Costs:** Referred to the cost of items such as network hardware, telecommunications and software licenses. These items are typically budgeted items and have a high visibility on a balance sheet.
- **Soft Costs:** Cost associated with non-tangible items. These include costs associated with loss of productivity due to downtime or training.

Typically, large organizations can save over 50 percent in hard costs in the first year following deployment. It should be noted that loss of productivity and training are categorized as soft costs, which are not directly considered part of the IT cost structure. However, organizations should consider these soft costs when determining how they will deploy applications in the future.

When comparing costs of Winterns and PC's, hardware is only a small portion. The large savings come from reduced maintenance needs, less help-desk expertise necessary, and less IT staffing requirements. Most organizations agree that the single largest budget item is the IT staff and this is where Thin Client computing stars.

A high-value Winterm product that meets today's needs can be converted into a high-performance Winterm product at a low cost to the user to meet new requirements for tomorrow.

### ***What are Organizations Seeking in a Thin Client Solution?***

Organizations are seeking a variety of items in implementing Thin Client technology, such as the following:

- ┆ Enhanceable—The ability to quickly respond to changing business requirements.
- ┆ Powerful—Prompt response to performance and capacity issues.
- ┆ Performance—Removal of inflexible system constraints.
- ┆ Functionality—Elimination of a single point of failure.
- ┆ Simplicity—A simple client to use with centralized computing.
- ┆ Customizable—A browser terminal with the option of centralized computing.
- ┆ Flexible—Local execution of a PC, but the benefits of a Thin Client device.

### ***What Vertical Markets does Thin Client Technology Exist in Today?***

All markets and industries can use Thin Client technology. Health care, manufacturing, banking, transportation, insurance, telecommunications, publishing, and educational institutes are only a few of the identified vertical markets that use Thin Client technology.

Organizations seeking continued host access, in addition to server access, might be well suited to Thin Client technology. Additionally, based on low [TCO](#), Winterns are compelling candidates for replacement of installed PC's. The administration and end user costs of PC's can be expensive and replacement of these PC's with Thin Clients can be justified financially without affecting the functionality. The larger the number of installed PC's at an organization, the more logical it is to use Thin Clients.

### ***What do the Industry Experts Report?***

Industry case studies show that Winterms require fewer staff to manage more machines, significantly reducing the TCO of technology. Gartner, Meta Group and Zona Research have showed companies deploying Winterms can save more than 40 percent over the costs of running PC's. According to Gartner, maintaining any kind of PC at the desktop, unless absolutely necessary to the task (a 20 percent probability) is a misallocation of unnecessary assets. Gartner suggests that Thin Clients can save an IT department 80 percent in support-staff costs. A Datapro report comments that the staffing required to support PC's is at least five times greater than for Winterms or PC's that are configured as Windows terminals.

"Because of fears of a worldwide economic decline in 2001, many organizations will avoid PC upgrades by deploying Thin Client applications." —Peter Lowber, Gartner senior research analyst, April 2001. According to the high-tech marketing model presented in Geoffrey Moore's book, 'Crossing the Chasm,' Thin Client computing appears to have made the transition from early adopters to early majority. Industry leaders as IBM, Hewlett-Packard/Compaq, Dell, and SunGard have partnered with Citrix, which confirms readiness for transition to Thin Client computing.

### **What is the Future?**

Over the past years, PC's have become essential in the business world. PC's are needed by people to do the work at their jobs—plain and simple. Computing is evolving and businesses have the option of using Thin Client technology to deliver business-class computing at a fraction of the cost of PC ownership.

Major industry analysts have favorable projections for the future of Thin Client Computing:

- Industry analysts predict that 10-30 million Winterns will be installed worldwide over the next five years. These Thin Clients will connect to multi-user versions of Windows NT/2000/2003 Server operating system, which is fast moving into the front ranks of departmental, divisional, and enterprise-wide computing.
- Gartner has estimated that Winterns can meet the computing needs of up to 80 percent of business users.
- The Aberdeen Group projects that Thin Clients could attract up to 30 percent of the PC market within five years.
- International Data Corp. (IDC) predicts U.S. shipments of enterprise Thin Client devices will grow from 929,000 in the year 2000 to over 4.8 million in 2004.
- Gartner, IDC and the Aberdeen Group predict that Thin Clients should reach 5-30 million units per year in three to five years.
- The market for Thin Client technology will grow nearly 500 percent from the year 2000 to 2004.
- Gartner predicts that Thin Client devices will last twice as long as similarly dedicated PC's.

If the analysts are correct, one in four future Thin Clients will not be Windows-based. However, they will focus directly on mainframe or UNIX-based legacy or host installations and add Internet, Intranet, or other browser-based graphics functionality to the enterprise, with a modicum of Windows NT/2000/2003-based applications.

The Thin Client market is viewed positively and the projected growth is high and growing quickly with the benefits and advantages being evident. The target markets are being clearly defined and addressed on a daily basis by Thin Client suppliers and their offerings. With endorsement of the Thin Client market by Microsoft, IBM, Citrix, Sun, Wyse Technology, Intergraph Computer Systems, National Semiconductor, and other big name players, Thin Client technology will continue to grow and be a significant part of corporate desktop computing in the future.



### ***Who Can Help?***

Not all organizations can implement Thin Clients and Windows Terminal Services on their own. Therefore, a knowledgeable, responsible integrator should be used. Selecting the best integrator for a critical technology project is an important decision for any organization.

The company selected should be one that can be trusted, is agreeable to work with, and has the ability to work through challenges. The location of their office should be convenient—to be sure they can be onsite when needed and to keep travel expenses at a minimum.

Qualifications to take into account are: authorized Microsoft partner, experienced staff that has Microsoft Certified Systems Engineer credentials, plus references where Thin Client technology was implemented by the company.

### ***Conclusion***

It is clear that cost is a key consideration for any organization considering a change in computing environments. Most organizations should see large returns in the first year of Thin Client deployment. Support and desktop related costs drop off quickly. Other major savings will result from reduced application downtime and diminished need for user support and training. Generally, clients choose a combination of products that meet their needs today and add on to the solution as their requirements change.

In this time of tighter spending and more focused technology investment, Thin Client technology keeps costs low and manageability high. The end result is organizations using Thin Clients are able to manage their bottom lines more effectively.

Less expensive, more efficient, more productive, and safer IT architecture are some of the benefits of Thin Clients. Thin Clients and Terminal Services combine the best features of PC's and mainframes, including the user-friendly interface (icons and other graphics) and software of PC's, plus the reliability and security of mainframes. Thin Client based computing is poised to become a major enterprise and business architecture in the coming years, as it is a very enticing solution.

### ***TRG's Approach to Thin Client Computing***

TRG's approach to Thin Client Computing insures that the migration is successful both technologically and culturally. The process consists of the following:

1. Formal Assessment of the Client's Needs

During the assessment TRG works directly with management and key system users to insure that the implications of implementing a Thin Client solution are understood from a financial and cultural perspective. The results of the assessment are then formalized into a report as summarized below.

2. Creation of a Report & Recommended Plan Detailing

- ◆ Return on Investment,
- ◆ Estimated 5 year Total Cost of Ownership,
- ◆ Transition of Software Licenses
- ◆ Work Plan for Deployment,
- ◆ Training, and
- ◆ Ongoing Support

TRG works closely with the client to schedule and implement each step of the plan. Throughout the process TRG insures that the transition from desktops to thin clients goes smooth and without needless disruption of client's workforce.

## **Appendix A: About TRG**

### **Why Choose TRG**

Technical Resource Group (TRG), headquartered in Santa Ana, California, was formed in 1995. TRG has a group of dedicated expert consultants who work together to align information technology with the business needs of its clients. TRG is highly respected in the business technology arena as well as being known for their service and support integration expertise. TRG has a long and successful proven track record. TRG's growing team of professional, high technology experts includes individuals that work together to solve business needs in today's ever-changing marketplace. TRG also has an outside team of nationally recognized experts in areas of strategic planning, business process improvement and key industry consultants that are available when their individual expertise and knowledge is required to assist the TRG team to solve client business challenges. Over the years, TRG has successfully partnered with its clients to deliver solutions in the areas of

- Strategic IT Planning and Deployment
- Business Process Improvement
- Application Evaluation, Selection & Implementation
- Custom Application Design and Development
- Infrastructure and Network Planning, Implementation & Management
- IT Facilities Management
- IT Security Administration
- Business Intelligence and Data Warehousing
- Document & Workflow Management

TRG has over 400 clients throughout the United States with a majority in the Southern California area. The company's loyal client base ranges from single user installations to the Los Angeles Unified School District that has a 1000-user installation. Talent, variety, size and stability—TRG has all the qualities and expertise that create a successful IT service company.

### **Philosophy**

TRG's philosophy is to give its clients a personal touch; however, still have a company structure and strength behind that personal touch.

### **Goal**

TRG's goal is to be the company our clients and prospects call for all their information technology and computing needs. TRG wants leverage its client's growth and sustained prosperity. TRG's team strives to deliver the best services, products and information possible to their clients and to provide them with in-depth insight, technical knowledge and solutions for the success of the organization.

## **Technology Partners**

TRG is proud to offer excellent powerful and high performance products and specialized services from these industry-leading technology companies:

### Software Products

- | **Microsoft**—Windows Operating Systems: 2000/2003/XP and related products such as Office, Exchange, IIS, VB & SQL Server
- | **IBM**—Database Products & Tools such as UniVerse, UniData, wIntegrate & SB+
- | **SurfControl**—E-mail and Web Filtering
- | **Raining Data** (formally Pick Systems)—Database Products & Tools such as D3, mv.BASE, mv.ENTERPRISE & FlashCONNECT
- | **jBASE**—Database Products & Tools
- | **MITS**—Business Intelligence Products
- | **Accusoft**—AccuTerm Terminal Emulator
- | **Esker Software**—DeliveryWare & VSI-FAX Fax Server
- | **Keynet**—Imaging Solutions
- | **Symantec**—pcAnywhere & Norton AntiVirus
- | **Veritas**—Backup Exec
- | **Via Systems**—Viaduct Terminal Emulator
- | **AcuPrint**—Secure Printing

### Hardware Products

- | Hewlett-Packard/Compaq—Intel-based Servers
- | IBM—RS/6000 (pSeries) Servers
- | Wyse—Wintems/Thin Clients
- | APC—Uninterruptible Power Supplies
- | PF Micro— Intel-based Servers

### Business Partners

- | **The Natural Intelligence Group (TNIG)**—Management Consultancy for business process improvement and reengineering
- | **Hartley & Associates**—Professional Services include Interim Management, Organization Building, Recruiting, Sales, Marketing & Advertising

TRG's account managers, technicians and consultants work closely with its partners to

develop solutions for specific clients' needs and to assist with every challenge for all types and sizes of organizations.

### **TRG Qualifications**

- Windows Terminal Server professionals on staff. At recent and upcoming trade shows, TRG is giving presentations on the benefits of Citrix, Windows Terminal Services and Thin Clients. Internally, TRG uses Thin Clients and Windows Terminal Services.
- Microsoft Certified Partner that has expertise in supporting Windows NT/2000/2003/XP, Exchange Server, Proxy Server, IIS and Excel. TRG has full-time Microsoft certified staff members (MCSE, MCP, MOUS).
- Authorized IBM reseller including UniVerse and UniData database products and tools and MITS business intelligence product and have on staff AIX operating system experts.
- Over 175 years of MultiValue/Pick application design, programming and support.
- Single Source for Hardware, Software and Services, if client desires a single source. Or, if client chooses, TRG can provide one piece of the puzzle if the client has coverage in other areas.
- Authorized Hewlett-Packard/Compaq Reseller (VAR) with Certified professionals (ASE) on staff.
- Value Added Reseller for all Raining Data products and tools including D3, mv.BASE, mv.ENTERPRISE and FlashCONNECT.
- Reseller of numerous supplementary products such as APC uninterruptible power supplies (UPS), Esker VSI-FAX faxing software, Keynet Imaging, AccuTerm terminal emulator, print servers, etc. that are important and necessary for TRG clients' IT requirements.
- Windows application and Web development teams that are knowledgeable in Visual Basic, SQL Server, FrontPage, HTML, etc.
- Professional Service employee consulting staff, in addition to specialized outside consultants to assist TRG employees when appropriate to solve the business needs of TRG's Clients.

TRG meets all the necessary qualifications for implementing Thin Client technology in an organization and has excellent references. In addition to referenceable clients such as Aloha Freight Forwarders and Pindler & Pindler, TRG has implemented Thin Client technology internally for all the same reasons mentioned in this paper.

TRG has dedicated and experienced resources to work with an organization to define needs, costs, options, and possible cost savings. TRG has experts in solving interoperability issues between existing desktop hardware, operating system platforms and Windows NT/2000/2003-based applications. Additionally, TRG has a proven track record after years of innovation and achievement and, as a technology leader, can bring more overall market understanding to Thin Client technology. With TRG's unparalleled experts in business solutions, TRG can assure organizations a reliable, compatible, high-performance Thin Client solution. For more information on Thin Client technology, visit [www.picktrg.com](http://www.picktrg.com).

### ***Technology Marketplace***

Organizations can choose a large and expensive consulting company that may not take the time to know the organization or their current technology. Organizations can choose a one-man shop that does not have the technology expertise in all the areas the organization needs and cannot keep pace with the ever-changing technology. A single person cannot possibly be knowledgeable in all areas of Information Technology (IT). There is also the high probability that the one-man shop might be out of business tomorrow.

TRG's team specializes in emerging technology solutions. TRG's service offerings include advisory, consulting and assessment services. TRG's close-knit team can bridge the gap between complex non-Windows based IT infrastructures such as UNIX and Windows NT/2000-based environments. TRG has the expertise that can provide cost-effective solutions that are specific to organizations in all their IT needs and business-critical applications.

### ***Contact Information***

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### ***References/Additional Resources***

[http://www.atlabs.com/thinclient\\_abt.htm](http://www.atlabs.com/thinclient_abt.htm)

<http://www.thinplanet.com/>

<http://www.pcmag.com/article2/0,1759,4721,00.asp>

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