Remote Access Technologies:

A Comparison of GoToMyPC™ and Microsoft® Windows® 2000 Terminal Services
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GoToMyPC is a cost-effective way to roll out and manage a corporate remote-access plan for telecommuters, work extenders and mobile professionals.

When compared to Microsoft® Windows® 2000 Terminal Services, GoToMyPC offers significant advantages. GoToMyPC is easier to set up, more available over networks with firewalls, and easier to use.
Executive Summary

Companies are looking for ways to provide cost-effective network access to their remote, mobile, and telecommuting employees. Remote control solutions such as GoToMyPC™ Corporate and Microsoft® Windows® 2000 Terminal Services are one way to provide this access.

With GoToMyPC Corporate, you can roll out and manage a remote access plan in minutes. It is a highly secure and cost-effective way for employees to access their computers and network resources remotely. Employees access and work on their computers using any Web browser.

Terminal Services requires that you configure a Windows 2000 server to support several clients accessing applications on the server. The server must have adequate hardware and software licenses to support multiple users.

This white paper demonstrates that GoToMyPC has significant advantages over Terminal Services. The advantages include:

- **Hardware and Software Investment.** GoToMyPC does not require a central remote access server. It also does not require that you install client software ahead of time. You can access and control a host computer from virtually anywhere with a Web browser. The Terminal Services central server requires a significant hardware and software outlay if you support several users.

- **Software Installation.** Installing GoToMyPC on the host and client computer is straightforward, and can be accomplished by novice users in less than five minutes. Terminal Services, on the other hand, requires significant hardware resources and administrator intervention for the host during installation. Terminal Services client setup requires performing several steps and additional configuration by the user.

- **Application Setup.** To set up GoToMyPC in an organization, an administrator invites users to download and install the software. Users are able to use all available applications in minutes. Terminal Services requires that an administrator activate users and set up applications on the server. Setup requires significant configuration.

- **Establishing Connections.** GoToMyPC establishes the connection to the remote computer easily with no configuration. Users only need to know their email address and passwords. Terminal Services requires that administrators establish an incoming connection to the server including firewall configuration.

- **Security.** GoToMyPC is pre-configured for security using the industry standard Advanced Encryption Standard (AES) 128-bit encryption. GoToMyPC connects through most firewalls, ensuring your data and network are secure. Terminal Services allows various encryption settings, including 128-bit encryption, however this level must be configured by an administrator.

- **Connection Costs.** GoToMyPC works securely across broadband Internet connections so no additional infrastructure or connection costs are necessary. Because Terminal Services users are more likely to connect using dial-up connections, higher telecommunications costs may result.

- **Reporting.** GoToMyPC has an online administration center that allows administrators to monitor current sessions or view detailed reports. Terminal Services does not have reporting capabilities unless you use third-party software to import and analyze log files.

- **Application Compatibility.** GoToMyPC runs to and from multiple operating systems using Windows 95, Windows 98, Windows Me, Windows 2000, Windows NT 4.0, Windows XP, Linux, Solaris, and Macintosh. Terminal Services requires that you run Windows 2000 Server as the host computer, and clients require a third-party add-on if they run anything other than Windows.

GoToMyPC provides a cost-effective, easy-to-implement, fast and secure way to provide remote access to corporate network resources. Users find that GoToMyPC is convenient because they can use it from almost anywhere without configuration.

Overall, GoToMyPC is an easier solution than Terminal Services, because users and administrators do not need to configure items such as security settings or the IP address. In addition, GoToMyPC is firewall friendly, making it a better solution for network administrators.
Remote Control Overview

One of the major issues confronting Information Systems managers today is providing secure access to corporate IS resources to people who are physically located outside of the corporate network. In today's increasingly connected society, traveling salespeople, telecommuters and work extenders all need access to resources on corporate networks. These resources - such as databases, sales tools, and email - are usually behind firewalls for security reasons so that they cannot be accessed from outside the corporation.

Remote Control Solutions

A common method for allowing remote access to protected computing resources is to use remote control software, such as Windows® Terminal Services. Such solutions ship only the keyboard input, mouse input and display output data between the local and remote computers. This functionality affords remote users access to servers on the corporate LAN, allowing them to remotely access applications through a Windows style interface similar to being on the LAN itself. However, traditional remote control solutions such as this one bring with them their own set of management and security challenges. This white paper compares the management and security issues of Microsoft Windows® 2000 Terminal Services with Citrix Online’s GoToMyPC.

Windows 2000 Terminal Services

There are two primary components to Windows 2000 Terminal Services: Remote Administration mode and Application Server mode. In Remote Administration mode, administrators can access and maintain Windows 2000-based servers over a network connection.

In Application Server mode, administrators centrally deploy Windows-based applications to clients over different network connections such as a local area network (LAN) or dial-up connection. With this mode, the software is installed once on a server, rather than on every desktop throughout the company.

In this paper, we compare GoToMyPC Corporate with Terminal Services in Application Server mode.

Revolutionary Solution: Citrix Online’s GoToMyPC

GoToMyPC is Web-based screen-sharing software that allows users to access and use any PC through the GoToMyPC Web site. With GoToMyPC, a user can see their computer screen, not just a Windows server profile. The user can access all of their computer’s programs, files and network resources as if they were sitting at and using their PC locally, even though they may be a thousand miles away.

All communications between the host and client computers are encrypted using 128-bit encryption. Only screen updates and keyboard and mouse input are sent between the host and the client computer used to access it (unless the user initiates a file transfer), so bandwidth demands are minimal.

Any Internet-connected computer can be used as a client to control the host computer because there is no need to install any client software. The client and host computers both initiate outward TCP connections on well-known ports, so firewall changes are usually not necessary.
Comparison: GoToMyPC and Terminal Services

Hardware and Software Investment

Windows® Terminal Services: The costs and requirements for enabling remote connections to a server (the host) using Windows Terminal Services will vary by the number of people needing remote access.

This requirement highlights the key difference between Terminal Services and GoToMyPC: With Terminal Services, several clients connect to one machine simultaneously, requiring that you upgrade your server hardware to accommodate the users.

If you intend to run several applications simultaneously, such as email, a spreadsheet, documents, a PowerPoint presentation, and browser windows, Microsoft recommends a dedicated Windows 2000 server with a minimum of 128 MB of RAM plus an additional 21 MB of RAM for each user. Typically, at least dual 1 GHz processors with 1 GB of RAM are required for 20 users, with these requirements scaling linearly as you add more users.

The hard drives need at least 128 MB free for the software installation plus twice as much as the server’s RAM size. Since hard disk throughput affects performance, a SCSI RAID (Redundant Array of Independent Disks) controller is required to achieve the highest performance levels.

Because the Remote Desktop Protocol (RDP) used in Terminal Services causes some network load, a high-performance Network Interface Card (NIC) should be used. Each user will likely consume 6 Kbps of network bandwidth. As well, if users are going to dial in remotely, an intelligent (microprocessor-based) multi-port asynchronous communications adapter is required to reduce interrupt overhead and increase throughput.

If your company expects to grow in the future, extensive research into the expansion plans should be performed as hardware prices could easily reach over $60,000 for less than 100 users, excluding your internal labor costs to manage the servers. Additionally, multi-user licenses must be purchased for each user and this cost can be prohibitive.

The hardware requirements for the client PC (the remote computer) include 4 MB of free disk space, a high-density 3.5-inch floppy drive, a NIC using the Microsoft TCP/IP protocol, and a serial mouse (100% Microsoft compatible). Although the client can have a 486/66 processor, a Pentium processor is recommended for the best performance.

Terminal Services clients are usually Windows-based machines. Connectivity for non-Windows-based machines such as MS-DOS, Macintosh, and UNIX requires a third party add-on such as Citrix MetaFrame.

Software that you make available to users must be installed on the Terminal Services server. However, many software packages must have setup modifications made before they work with Terminal Services. These include Lotus Notes 4.x, Microsoft Office 2000, and Visio 5.0. You can find information on these unsupported programs at: http://www.microsoft.com/windows2000/techinfo/administration/terminal/tsapcompat.asp

GoToMyPC: Only the user’s existing PC and the computer they are connecting from are required to use GoToMyPC. While Terminal Services requires a robust server to handle multiple clients, with GoToMyPC there is no need for a central remote access server. For the host and client computers (the computer you will connect to and the computer you will connect from) a Pentium 300 with 64 MB of RAM is recommended, although it will run on lesser computers as well. Both computers may run any of the following operating systems: Windows 95, 98, 2000, Me or NT.

GoToMyPC allows users to control a remote machine from any Internet-connected machine using a Web browser, and does not require any special hardware or software to be installed ahead of time. There are no concerns about scalability or performance, as GoToMyPC will provide all the resources for you. You can concentrate on your business; not your remote access.

With GoToMyPC, clients running many operating systems can access their host computer, such as Windows 95, Windows 98, Windows Me, Windows NT 4.0, Windows 2000, Windows XP, Linux, Solaris, and Macintosh.
Software Installation

**Windows® Terminal Services:** Before attempting installation of Terminal Services, Microsoft recommends that a clean installation of Windows 2000 Terminal Services edition is performed rather than trying to install Terminal Services onto a pre-existing Windows 2000 installation. Terminal Services must be installed as a stand-alone server on an NTFS (Windows NT File System) partition and not as a primary domain controller or backup domain controller so that it isn’t required to authenticate any domain log on sessions or maintain a directory database. Otherwise, its resources will not be focused on providing client access.

Once Terminal Services is installed, a License Server must be installed on a domain controller and the software for the users must be installed on the terminal server.

Installing the Terminal Services client software requires that a 17-step process be performed on each computer. The steps include inserting the 3.5-inch floppy disk (or accessing a previously configured network share with the files), running the program, editing the settings such as server names and IP addresses, and logging into the system. The time it takes to install it can vary greatly depending on the speed of the computer and the technical knowledge of the user.

It is possible for administrators to configure the Terminal Services Advanced Client (TSAC) so users can run Terminal Services sessions within Microsoft® Internet Explorer 4.0 or later. Although using this ActiveX® control (COM object) allows users some form of Web-based access, it requires significant configuration and support from the administrator.

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**GoToMyPC:** Installation of GoToMyPC is accomplished by simply logging onto [https://www.gotomypc.com](https://www.gotomypc.com), clicking “Add Computer,” and creating a password for your computer. Installation and use is so easy that a non-internet savvy user can set up and start using GoToMyPC in less than five minutes. There are no special requirements for operating systems or complicated settings to figure out.

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**Figure 1:** Software installation with GoToMyPC is fast and easy

**Figure 2:** Terminal Services requires several steps for the host and client
Application Setup

**Windows® Terminal Services:** After installing Terminal Services the administrator (the person who manages the account) must activate the users and decide which applications users are going to be able to access.

There are several management programs within Terminal Services that are used to activate users, set up programs, and perform other essential functions. The Client Connection Manager, Terminal Server Administration, License Manager, and Distributed File Systems Support are just a few of the many management tools an Administrator must know in order to enable a user for remote access.

To enable a user for their initial application requires 10 steps at minimum. To remote-enable each subsequent application involves adding application scripts for each piece of software. For instance, remote enabling a user for email, word processing, and spreadsheet applications would require 10 initial steps and three separate application scripts. Custom-developed applications like a company’s data entry system require that a custom script be created to ensure proper program functionality, and possible modification of the program itself if it is not compatible with Terminal Services.

**GoToMyPC:** To add and enable users, the GoToMyPC administrator simply enters the email addresses of the users into a Web form, which automatically emails the user with the info they need to log in. An entire company can be set up in just a few minutes.

**GoToMyPC**

**Access and Control Your Computer: From Anywhere.**

**Log Out**

**Home**

**Sign Up Users**

**Manage Users**

Active Connections

Generate Reports

My Account

Contacts

FAQs

**Manage Users of GoToMyPC**

GoToMyPC allows users to access their accounts via a web browser. GoToMyPC automatically emails the user with the login info. The administrator can also set up users via the Manage Users page.

**Figure 3:** Administrators invite users to install GoToMyPC with an email

There are no changes needed within GoToMyPC in order to access applications. Any application, including proprietary or company developed software, will be fully functional with GoToMyPC. Once a computer has been added, the user is able to connect and use it immediately. The GoToMyPC technology allows complete control of your desktop. As soon as a new program is installed on the host computer, users have immediate access to it.

**Figure 4:** Administrators must master several management tools to enable Terminal Services
Establishing Connections

Windows® Terminal Services: To connect to the server using Terminal Services, it is necessary to establish an incoming connection to that server. The most convenient way to do this is over the network. This provides the best performance and quickest connection setup, although it creates a load on the network.

Network traffic can be minimized with compression. For a mobile user, compression is essential to maximize speed. Unfortunately, when traffic to the Terminal Services is compressed, the server’s performance takes a corresponding hit and traffic slows down. The slowdown is caused by the server managing additional processor cycles decompressing communication packets.

Network connections that require an incoming port are also problematic for firewalls. Corporate firewalls will almost certainly block incoming connections from the outside, and even in cases where a company’s security policy allows such incoming connections, providing this capability requires significant administrative overhead both for Terminal Services and the firewall itself.

GoToMyPC: With GoToMyPC, both the host and client computers receive all communications through an outgoing TCP connection, using protocols and ports that can transparently transit almost all firewalls. Since GoToMyPC is firewall friendly, generally no settings or changes to your existing firewall are required. Users need only remember their email address and password and the access code of the computer that they wish to connect to.

Figure 5: Connecting to the host with GoToMyPC is straightforward

Every connection has full compression automatically. GoToMyPC was created with high connection speed in mind so its compression actually increases speed and does not create limitations for the users. The host PC supplies its own compression and the client PC provides the decompression. This creates a very scalable system, as there isn’t a server to become inundated and slow connectivity due to compressing/decompressing multiple sessions at once.

Figure 6: Connecting clients to the Terminal Services server can be complicated
Security

Windows® Terminal Services: Multilevel encryption support is provided with Terminal Services, which means that the administrator has the ability to alter settings depending on the level of security wanted. Terminal Services provides three levels of security, low (40-bit 1-way), medium (40-bit 2-way), and high (128-bit 2-way), with low-level encryption set as the default. With different levels of security available, the requirement for a knowledgeable administrator takes on greater importance. Inadequately configured security settings in Terminal Services can, at numerous points, create a means for hackers to invade the corporate network.

The administrator needs to know such security details as disabling anonymous FTP (File Transfer Protocol) to keep the public out of the network’s file system. If DOS applications are used, it is especially important to limit access, as a DOS prompt is a common means for loading viruses and damaging the system. Firewalls require openings to allow Terminal Services to communicate with mobile users. Purchasing a firewall that verifies user ID’s rather than TCP/IP addresses is recommended to keep hackers from using IP emulators to fool your system into allowing unauthorized access.

GoToMyPC: There are no security settings that can accidentally be configured incorrectly with GoToMyPC. GoToMyPC traffic is encrypted from start to finish with Advanced Encryption Standard (AES) 128-bit encryption using a secure challenge-response password authentication protocol. AES is the encryption selected by the National Institute of Standards and Technology (NIST) due to its security, computational efficiency, modest memory requirements, flexibility, and simplicity. AES is expected to become the U.S. government’s designated cipher for protecting sensitive information before 2002.

GoToMyPC also includes security features such as multiple nested passwords, access notification, host screen blanking and host keyboard locking.

Figure 7: AES 128-bit encryption is built in to every GoToMyPC session
Connection Costs

Windows® Terminal Services: Many companies set up modem pools so that dial-in users can establish network connections using Terminal Services. In addition to the security implications of this approach, this technique can result in very high telecommunications costs. Either the user is forced to pay for long-distance calls, or the company must establish a toll-free number and pay for incoming calls in addition to allocating administrative overhead for provisioning and maintaining the correct number of extra phone lines.

GoToMyPC: By making network-supported connections secure, reliable and functional even in an environment with firewall protection, GoToMyPC allows users to confidently connect from any broadband ISP through the company’s existing Internet connection. No extra infrastructure is required at the central office, affording significant cost savings.

Reporting

Windows® Terminal Services: Most employers want detailed reporting about how many users are making remote connections, the employee names, and for what length of time they were connected. Obtaining this information with Terminal Services requires the use of third party software in order to import the log-file format data into a user-created database, which then must be analyzed by using third-party data-analysis software.

GoToMyPC: Monitoring current sessions in progress or reviewing user connection history is a simple process with GoToMyPC. A monitor function can be selected with one click after logging into your account that will display everyone who is currently online with connection info. There is even a link to end employees’ sessions immediately. An additional reporting section allows the manager to view detailed reports by individual or the whole company for any time frame in either HTML or Excel format.

Figure 8: GoToMyPC has reporting features not found in Terminal Services
Platform Compatibility

**Windows® Terminal Services:** As mentioned earlier, Terminal Services requires that you run Windows 2000 Server as the host computer. On the client side, Terminal Services by default supports only Windows operating systems. Other operating systems require a third-party add-on.

**GoToMyPC:** GoToMyPC has the advantage of being able to provide remote access capabilities both to and from multiple operating systems. GoToMyPC can be used from and to Windows 95, Windows 98, Windows Me, Windows 2000, Windows NT 4.0, and Windows XP. In addition, the client can run Linux, Solaris, and Macintosh.

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<th>Platforms Supported as Host Computer</th>
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<td>Macintosh</td>
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Conclusion
In contrast to other remote control packages, GoToMyPC can provide a cost-effective way to provide secure remote access to corporate computing resources with no downside in terms of extra management, loss of security or loss of performance.

GoToMyPC is also far more convenient for the users because it does not require any client software, is accessible from any Web browser, and does not require prior knowledge of the remote resource.

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