



A Comparative Evaluation of Remote Administration Tools

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Abstract: Remote administration is important for improving efficiency in managing and maintaining computer systems across communication networks in a cost-effective manner. Contemporary remote access tools support versatile features for controlling remote systems through a wide range of attractive features.

Many remote administration tools are found in the market and it is difficult to choose appropriate tools to meet our needs. This paper presents comparative study of selected popular remote administration tools to help users in making appropriate selection of suitable tools. The paper undergoes comparison among various categories, such as Graphical User Interface (GUI) oriented tools, Command-Line Interface (CLI) tools, Windows Management Instrumentation (WMI) tools, Web based GUI tools, Console based tools, etc. considering various popular remote access software tools.

Keywords: Remote administration; Remote Access Tools (RATs); Communication Networks

I. INTRODUCTION

A remote access software tool refers to a piece of software that allows a user to control a remote system as if a user has a physical access to that system [1]. Modern remote access tools support a wide range of capabilities, such as file management, remote computer control, screen capturing, shell control, registry management, etc. A remote control software allows us to take control of a remote computer on a communication network, so that we can see the remote computer's screen on our monitor and all the mouse movements and keystrokes are directly transferred to the remote machine. Because the service requires sending small amount of information and it often takes advantage of compression technologies, it can work well in low-bandwidth scenarios also. While remote administration tools [2, 25] have many legal uses, they are frequently associated with malicious activities also.

Remote administration tools may be developed using a client/server technology. The server software executes on a controlled computer, which receives commands from the client software that may be installed on a remote host. Some of the popular remote access tools found in the market include GoToMyPC, LogMeIn, TeamViewer, ProRat, Sub Seven, Bifrost, Black Orifice, Bandoor RAT, Optix Pro, BlackShades Remote Controller, Y3K Remote Administration Tool, DarkComet RAT, etc. [1]

Today, there are many software tools that allow us to gather information about remote computers from our own desk. These tools can help us in initiating certain actions for resolving various problems as if we were logged on to the remote computer. Selection of remote administration tools generally depends on various factors such as network configuration, security requirements, end-user participation and even your own comfort level apart from others.

A remote access tool allows users to use a desktop, laptop or a mobile device to connect to another computer or server from any location. Instead of carrying your laptop along with your luggage, we can make use of "remote

desktop" software to access desktop from any place in the world [3]. Some virtualization platforms allow a user to simultaneously run multiple virtual machines on local hardware, such as a laptop, using hypervisor technology. The controlling computer displays a copy of the image received from the controlled computer's display screen. The copy may be updated periodically, or when a change in the screen is noticed by the remote control software. The controlled computer then behaves as if the actions were performed directly on that computer.

There are many types of remote administration tools and methods available globally, from which appropriate selection can be made. Some are built into operating systems, like Microsoft's Remote Desktop capability, whereas others are available as commercial or open source solutions, such as Virtual Network Computing (VNC) [4].

The rest of this paper is organized as follows. Various techniques used in remote administration tools are discussed in the next section. It is followed by coverage on selected tools for remote administration. An analysis of comparative evaluation among remote administration tools is discussed thereafter. Finally, we present our concluding remarks on the study.

In the section that follows, we make an attempt to identify salient characteristics of some important categories of remote administration tools.

II. GENERAL CATEGORIES OF REMOTE ACCESS TOOLS

Remote access tools can typically be classified into different categories like Graphical User Interface (GUI) oriented tools, Command-Line Interface (CLI) tools, Web based tools, Console based tools, etc. In this section, we present salient characteristics of these major categories of remote access tools.

A. GUI oriented tools:

GUI oriented remote access software tools allow a user to remotely administer another computer through a

Graphical User Interface (GUI). These tools offer plenty of control on an operating system to complete a particular task [5].

A GUI oriented tool requires a lot more system resources because of each of the elements that need to be loaded, such as icons, fonts, etc. In addition, video drivers, mouse drivers, and other drivers that need to be loaded also consume additional resources.

GUI oriented tool such as Linux Remote GUI provides graphical interfaces on multiple machines, and is extremely useful for system administrators. Another popular tool is SSH, which is used to establish a secure connection to a remote UNIX machine. SSH is included on most UNIX implementations, including Solaris, Linux and Mac OS X. SSH and LogMeIn use Graphical User Interface based techniques to connect to remote computers [6].

GUI oriented software tool called VNC (Virtual Network Computing) uses a cross-platform thin client technology, and was originally developed by Olivetti Research Labs in Cambridge, England, who were later acquired by AT&T. VNC is a graphical desktop sharing system that uses the RFB protocol to remotely control another computer. It transmits the keyboard and mouse events from one computer to another, relaying the graphical screen updates back in the other direction, over a network.

Although remote graphical access is becoming popular and is possible using GUI, not all computers and especially not all network equipment incorporate this ability.

B. Command Line Interface (CLI) Tools:

It is possible to access command-line prompt on remote PCs using different tools and technologies, such as Telnet and SSH, remote desktop tools and remote process execution utilities. Some of these tools have known limitations, whereas some tools support a wide range of functionalities. It is possible to access a command-line interface through a serial port or over the Ethernet [7].

The approach is to establish a remote session where user commands execute on the remote computer. Powershell 2.0 includes this feature, which requires that WinRM be installed and configured on your machine and the remote machine. This means Power Shell 2.0 must be installed everywhere and configured for remoting. If we have Windows 7, the first part is already done. To enable remoting, we need to run the Enable-PSRemoting cmdlet on each machine [8].

The CLI architecture is based on a hierarchical namespace, which is a predefined tree that contains every managed object in the system. This namespace defines the targets for each command verb. The CLI generally provides different privilege levels, like administrator, operator, user, callback, etc.

Often when accessing another computer or networking device over a network, a user will only be able to manipulate the device or files using a CLI. Some CLI architectures enable a user to easily script a sequence of commands to perform a task or execute a program.

Although many command line environments are capable of multitasking, they do not offer the same ease and ability to view multiple things at once on one screen. Terminals within a desktop environment like GNOME (GNU Network Object Model Environment) allow for multitasking — one can use multiple terminal windows [9].

C. Console Tools:

Using console tools one can manage the computer as if a person are sitting in front of it. This type of remote connection is totally transparent to anybody logged on interactively.

Console tools such as DameWare Remote Support let us manage and administer Windows computers remotely from a single console. It includes features like remote rebooting of a computer, starting, stopping and restarting Windows services, Copying/deleting files, Viewing and clearing the Windows event logs [10].

D. Web Based GUI Tools:

Web-based Administration tool is a system management application for administering remote computers on a web. It uses its graphical interface to enable the user to access and manage multiple remote machines. It supports dynamic monitoring and administrator notification of system events [13].

Web Based GUI Tools generally allows us to remotely view a computer's file system, perform security audits, support various utilities for restarting a computer, drag-and-drop file transfer, remote printing, and guest invite and chat, view running applications and open windows, system information, desktop screenshots, and much more. [24].

The remote console application, which we access via a web browser, may enable us to control the server's operating system remotely using a screen, mouse and keyboard, and to redirect local CD and diskette drives as if they were connected directly to the server.

The Web based remote administration tool NagiosQL is a web-based GUI tool that we can use for the administration work. It includes features like user management, MySQL database platform, create and download configuration files and manage and use all of your configurations [13].

Webmin is a web-based interface for system administration for UNIX. Using any modern web browser, we can setup user accounts, Apache, DNS, file sharing and much more. Webmin removes the need to manually edit UNIX configuration files like /etc/passwd, and lets you manage a system from the console or a remote machine [14].

The Web based remote administration tools like GoToMyPC is a hosted service that enables secure browser-based access to any Internet-connected Microsoft Windows-based PC [24].

III. FEATURES OF SELECTED REMOTE ACCESS SOFTWARE

Software tools used to facilitate remote administration [26] must include strong encryption, robust authentication, and privilege assignment, along with auditing and logging capabilities in order to meet security needs. Remote access applications such as GoToMyPC, LogMeIn, TeamViewer and VPN are among the most useful contemporary technologies. We make an attempt to briefly overview the salient features of these tools in the following section.

A. GoToMyPC:

GoToMyPC easily transfers a file from one computer to another and synchronizes files and folders with a single click. All data is protected with 128-bit AES encryption. Account access is protected by dual passwords and end-to-

end user authentication. The user can view the full displays of his computers, even if they are using multiple monitors.

It includes features such as Online administration of account and users, support for monitoring employee usage in real time, support for generating daily, weekly and monthly usage reports, shared access to a computer, etc. This software tool allows for an account administrator to easily distribute GoToMyPC to multiple users and include enhanced administrative security features.

GoToMyPC is a hosted service that enables secure browser-based access to any Internet-connected Microsoft Windows-based PC. **GoToMyPC** enables fast, easy and secure remote access to a PC from any web browser [16]. GoToMyPC also supports Voice over Internet Protocol, which means, if both computers have microphones and speakers, the host and recipient users can hear one another, and both users can hear sounds produced by the host computer [17].

GoToMyPC increases productivity by allowing employees to work in their familiar desktop environments remotely, improving morale, and employee retention and work flexibility [18].

B. LOGMEIN:

LogMeIn offers remote access to our desktop so we can open files, check emails, run programs and stay productive from our mobile device or any computer over the Internet. It provides fast, easy and secure access to remote computers that can be set up in short interval of time.

This software tool uses a proprietary remote desktop protocol that is transmitted via SSL. An SSL Certificate is created for each remote desktop and is used to cryptographically secure communication between the remote desktop and the accessing computer.

In the LogMeIn architecture, there are three entities that take part in every remote access session [19]. The “client” or the “user” is the person or software accessing a remote resource. The “host” or the “server” is the computer being accessed, or the LogMeIn host software on this computer.

The “gateway” is the LogMeIn service that mediates traffic between the client and the host. LogMeIn is designed to allow secure access to remote computer.

LogMeIn remote access includes products such as **LogMeIn Pro** – subscription-based remote access and administration software, **LogMeIn Central** – Web application for remotely managing LogMeIn host software and VPN connectivity services, **LogMeIn Rescue** – remote support Web application, **LogMeIn Ignition** – software for facilitating access to computers running LogMeIn host software from Windows, Androids devices.

C. TEAMVIEWER:

The Team Viewer [20] was first released in 2005 with the most current version being v7. It runs on a proprietary protocol, AES encryption, and is distributed on a Part Free/Part proprietary license.

Team Viewer remote desktop software offers features such as File Transfer, Audio Support, Multiple Monitors, Seamless Window, Access Permission Request, NAT Pass-through, etc. It supports the platforms like Mac, Window and Linux, Others.

TeamViewer doesn't have the well-designed interface, but it equips users with enough basic functionality for their

productivity tasks and throws a few extra features into the mix.

D. VPN:

The Remote Access VPN Software [22,26] provides users with secure as well as seamless access to corporate networks and resources when traveling or working remotely. Privacy and integrity of sensitive information is ensured through multi-factor authentication, endpoint system compliance scanning and encryption of all transmitted data.

It eliminates the need for users to re-authenticate when roaming between different network types (LAN, WiFi, GPRS, etc.), using intermittent networks or resuming work from sleep mode.

VPNs can be either remote-access or site-to-site [23]. In a corporate setting, remote-access VPNs allow employees to access their company intranet from home or while traveling outside the office, and site-to-site VPNs allow employees in geographically separated offices to share one cohesive virtual network. A VPN can also be used to interconnect two similar networks over a dissimilar middle network; for example, two IPV6 networks over an IPV4 network.

VPN systems can be classified by various criteria as shown below:

- a. the protocols used to tunnel the traffic
- b. the tunnel's termination point, i.e., customer edge or network-provider edge
- c. whether they offer site-to-site or remote-access connectivity
- d. the levels of security provided
- e. the OSI layer they present to the connecting network, such as Layer 2 circuits or Layer 3 network connectivity
- a) **Remote Access (Client/Server) VPN** - The Remote Access mode creates a VPN tunnel between multiple remote users and other servers inside or outside of the eApps network. Generally this configuration is used to secure a private application service for a group of users.
- b) **Site to Site VPN** - This mode establishes a VPN tunnel between our eApps and a remote site. The configuration is generally used to invoke a server to server VPN for secure transfer of data from the eApps network to a remote network.

E. WMI (Windows Management Instrumentation) Remote Administration Tools:

WMI (Windows Management Instrumentation) is the management framework available in recent Windows systems. WMI is built on the COM (Component Object Model) infrastructure and can thus operate remotely, using DCOM (Distributed COM). WMI is frequently used by Windows administrators with VBS scripts.

In addition, several WMI-based administration tools are available by default on Windows systems to administer remote systems using WMI [11]. Given below is a brief review of these tools.

- a. **WMI Control MMC snapin:** The WMI Control MMC snapin (wmimgmt.msc) is used to configure the WMI framework. WMI settings can be configured on either a local or remote system, choosing Properties after clicking on the WMI Control icon.

In Windows 2000 and Windows XP, the WMI Control MMC snapin supports alternate credentials in the Change manager computer dialog box.

- b. WMI tester (wbemtest.exe):** WMI tester (wbemtest.exe) is a tool available in all WMI implementations (Windows 2000, Windows XP and Windows Server 2003). WMI tester is originally a WMI testing tool but it also makes an interesting WMI-based administration tool.
- c. WMIC (WMI command-line tool):** WMIC (wmic.exe) is installed by default on Windows XP and Windows Server 2003. WMIC does not run on Windows 2000.

WMIC is typically used in interactive mode. The remote system name is specified with the /NODE option [12]. Alternate credentials can be used with the /USER and /PASSWORD options.

a) Winmsd.exe:

In recent Windows systems, winmsd.exe has been replaced by the msinfo32.exe program. However, winmsd.exe is in the system path whereas msinfo32.exe is not so it is easier to use winmsd.exe. Winmsd.exe is a stub

executable that starts msinfo32.exe. Winmsd.exe supports a "/computer" option, used to specify a remote system name. When this option is used, the system configuration of the remote system is obtained using WMI and displayed by the program.

Winmsd does not support alternate credentials and cannot apparently be used with the /net only option of runs.

IV. COMPARISON AND ANALYSIS

Comparative evaluation from the viewpoint of general information, remote access capabilities for different operating systems and important features for some popular tools such as GoToMyPC, LogMeIn, TeamViewer and VPN is presented in this section. We have also provided the comparison charts of some of the features such as remote access features, file transfer, security, protocol support and platform support in some popular remote administrator tools. It presents the strengths of these remote access tools and helps IT professionals to choose the remote administrator tool that suits their professional needs.

Table 1. Remote Access Capability

Software	Server: Microsoft Windows - 7 & XP	Client: Microsoft Windows - 7 & XP	Server: Linux	Client: Linux	Client : Java	Client: Android	Server: Mac OS X	Client: Mac OS X	Server: OS/2 eComStation	Client: OS/2 eComStation
GO TO MY PC	Y	Y	N	Y	Y	Y	Y	Y	N	N
Log me in	Y	Y	N	N	Y	Y	Y	Y	N	N
Team viewer	Y	Y	Y	Y	Y	Y	Y	Y	N	N
VPN	Y	Y	N	Y	N	Y	N	Y	N	N

Table 2. Important Features

Software	Client/server /listening	Access from any PC	File transfer	Audio support	File Synchronization and transfer	Multiple Monitor Support	Seamless window	NAT Pass-through	Remote Printing	No Firewall Configuration required	Support of IPV6
GO TO MY PC		Y	Y	Y	Y	Y	?	?	Y	Y	N
Log me in	Client & Server	Y	y	Y	Y	Y	N	Y	Y	Y	N
Team viewer	Client & Server	Y	Y	Y	Y	Y	Y	y	Y	Y	?
VPN		Y	Y	Y	Y	Y	N	Y	Y	Y	N

Comparative Charts

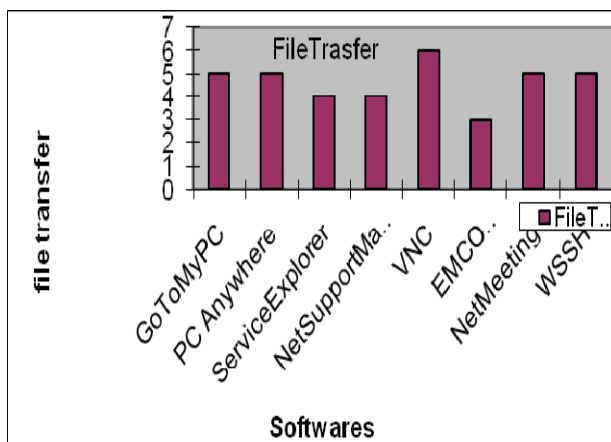


Figure: 1

Table: 3

Softwares	FileTrasfer
GoToMyPC	5
PC Anywhere	5
ServiceExplorer	4
NetSupportManager	4
VNC	6
EMCO Remote Desktop	3
NetMeeting	5
WSSH	5

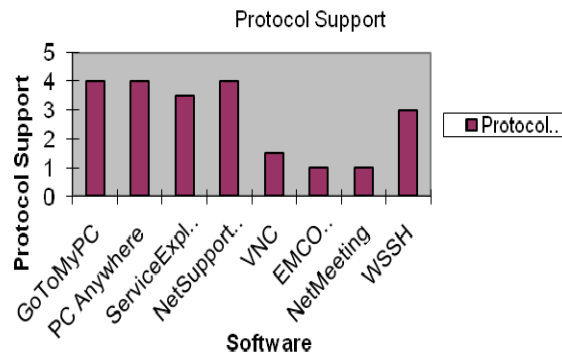


Figure: 2

Table: 3

Softwares	Protocol Support
GoToMyPC	4
PC Anywhere	4
ServiceExplorer	3.5
NetSupportManager	4
VNC	1.5
EMCO Remote Desktop	1
NetMeeting	1
WSSH	3

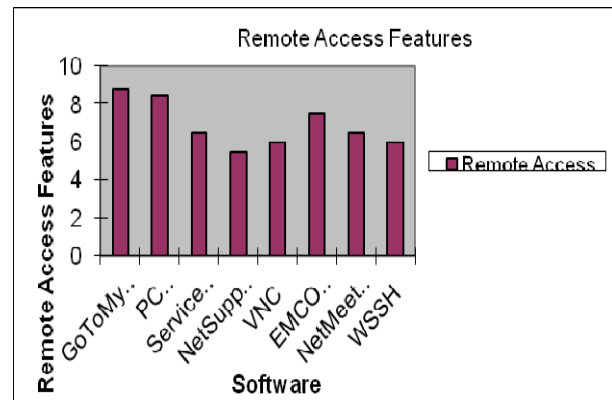


Figure: 4

Table: 5

Softwares	Remote Access Features
GoToMyPC	8.8
PC Anywhere	8.5
ServiceExplorer	6.5
NetSupportManager	5.5
VNC	6
EMCO Remote Desktop	7.5
NetMeeting	6.5
WSSH	6

V. CONCLUSION

Remote access tools allow users to use a desktop, laptop or a mobile device to connect to another computer or server from any location, and enable us to improve efficiency in managing and maintaining computer systems across communication networks in a cost-effective manner. Contemporary remote access tools support versatile features for controlling remote systems through a wide range of attractive features. Many remote administration tools exist in the market and it is difficult to choose appropriate tools to meet our needs. In this paper we have presented comparative study of selected popular remote administration tools to help users in making appropriate selection of suitable tools. The paper undergoes comparison among various categories, such as Graphical User Interface (GUI) oriented tools, Command-Line Interface (CLI) tools, Windows Management Instrumentation

(WMI) tools, Web based GUI tools, Console based tools, etc. considering various popular remote access software tools.

GoToMyPC has a variety of features and offers good performance. However, it provides access to the host computer through a Java-based client, which may not work for some users. Team Viewer's all-in-one client is free, and using it to transfer files among computers costs nothing. It also supports more OS platforms than the other remote-desktop services. However, it doesn't support audio, and if we are satisfied with Web-based performance, then TeamViewer is a good choice. LogMeIn appears to be supporting basic features.

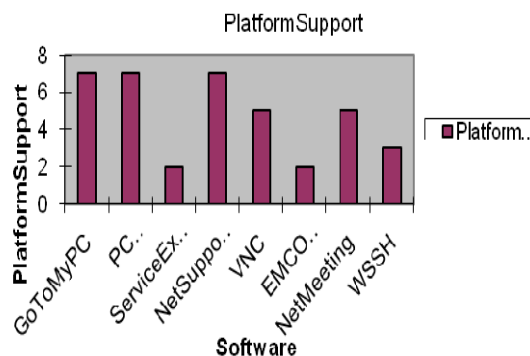


Figure: 3

Table: 4

Softwares	Platform Support
GoToMyPC	7
PC Anywhere	7
ServiceExplorer	2
NetSupportManager	7
VNC	5
EMCO Remote Desktop	2
NetMeeting	5
WSSH	3

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