Network Station - Thin Client Computing - Overview

Overview

The objective of this document is to help develop an understanding of a Server Based Computing/Thin-Client environment using MS Windows NT® 4.0, MS Terminal Server 4.0, Citrix Metaframe, IBM Network Station Manager, and IBM Network Stations. It provides an overview of the different components involved in an enterprise Network Computing solution design and implementation.

In order to migrate to a server based, or thin client model, three important factors must be considered: the applications requirements, the server configuration and the network capacity. The systems integration of applications, servers, and size/speed of the network is most critical, and should receive proper analysis and architecting considerations before a migration begins. Network, or server based computing, isn't just network, or thin clients, or servers. It is the sound integration of all of those components after having gained an understanding of the footprint requirements of the applications and the level of user demand upon the system.

Applications and Capacity Planning

Applications and capacity planning have always been a significant aspect in the design of any computer system, but it is especially important when designing a Server-Based Network Computing solution. The traditional Windows-based distributed computing environment in its simplest form provides users with an operating system running on the local PC workstation and access to local and remote applications and network resources. The computing environment that is provided by Windows Terminal Server is significantly different. The Windows Terminal Server provides users with the desktop (operating system), applications, and network resources via remote network communications between the client, and the WTS.

Capacity planning for the WTS begins by identifying the factors that impact system performance and how they affect performance. Factors that should be considered in any capacity planning strategy include the following: WTS applications, user characteristics, and the network environment. In essence, you should become familiar with how your applications, users, and network environment will impact WTS performance.

Know Your Applications

It is important to understand how a particular application will operate on a WTS. Applications executing on a WTS may react very differently than when operating in a traditional Windows-based computing environment. Knowing your application may require asking the following questions: How graphics-intensive is the application? How much memory does the application require? How much of the application's memory is shareable between users? How does the application refresh the screen? Does the application require a lot of typing? Applications need only be installed once on Terminal Server for multiple users to have access to them. Thus, upgrading in much easier if required in the future, the upgrade need only be done once.

Limiting MS-DOS Applications

Take care when deploying applications written for MS-DOS. Standard MS-DOS applications will require more memory because each application will spawn its own 16-bit Windows on Windows (WOW) subsystem.

Know Your Users

User usage patterns have a significant impact on WTS performance and should be considered carefully when designing a capacity planning strategy. Knowing your user may require asking the following questions: Do your users leave the applications open? When do users log on? Do the users stay logged on throughout the day? Are logons evenly distributed throughout the day or are most logons at a specific time of the day?

Know Your Network

Understanding the network environment is especially important when designing a WTS solution that involves WAN communications. Because WTS provides both applications and the desktop to the user, network communications are very important. Even infrequent network slowdowns can provide unacceptable performance to WTS users. Knowing your network may include the following questions: How fast do your users type? Are the applications graphics-intensive? What is the typical display resolution of your client workstations? What is the network bandwidth required for a user running the application?

Server Configuration Considerations

Boot Server (Base Code Server)

The boot server provides the base operating system of the IBM Network Station (the kernel), all application modules for the native applications such as the 3270 and 5250 emulators, the NC Navigator browser, etc., the fonts file, and the Java classes.

Configuration Server

The terminal configuration server provides the terminal based hardware preferences. These are all the configuration files that set the characteristics of the terminal (the IBM Network Station) itself, regardless of which user is actually using it. In other words, this is all the configuration data BEFORE the user identifies itself by logging into the Network Station.

Authentication Server

The authentication server provides basically all the configuration data that is specific to a particular user.

DHCP Server

Dynamic Host Configuration Protocol (DHCP) Server provides the Network Stations with an IP address. Once a DHCP server responds positively to the client, giving him an IP address to use for a specified period of time, the client becomes operational and uses the allocated IP address to communicate on the network. Using a DHCP server is always the preferred method for a thin client to get its network configuration data. However, if a DHCP server is not available or not possible, the Setup utility of the thin client can be used to enter the required network and boot configuration data into its NVRAM (IBM Network Stations require additional User Definable Options in the DHCP Scopes).

RAS Server

Remote access allows you to access remote network resources or access the main network from a remote location. Windows NT does this through remote access server service. The remote access server is usually a Windows NT® 4.0 Server with the remotes access server services installed (there are other remote access server applications available from third party vendors that maybe used instead of Microsoft's RAS Server).

Primary Domain Controller Server - (PDC)

The domain server that contains the master copy of the security, computer, and accounts database and that can authenticate workstations. By default, every NT domain contains at least one NT Server that has been installed as a PDC.

Backup Domain Controller Server - (BDC)

A BDC off loads logon authentication from the PDC and provides fault tolerance in the event that the PDC becomes unavailable. The BDCs receive automatic updates of the security and user databases from the PDC.

Separation of Servers

Network Architecture and Design Considerations

Generally, you should consider the network infrastructure when deploying Terminal Server. This step is especially important when you are replacing legacy systems with Network Stations or personal computers and you must connect these new systems to the network so they can gain access to Terminal Server. In most cases effective deployment will depend on careful planning in a number of areas related to the infrastructure.

When you add any new systems to the network, be sure to include a physical path to the servers and domains to which they need to gain access. Take a particular care to configure routers correctly to establish a network path from the client to the server.

Place all servers running Terminal Server on a backbone for optional bandwidth usage. Use the highest bandwidth segment available on your network. For example, do not use a 10-Mbps segment if 100-Mbps segment is available.

NT Domain

It's important to remember that no single domain design should be considered "correct." Every organization will have a different architecture to accommodate different needs and limitations, and you must plan the Terminal Server deployment accordingly. However, you should keep in mind a few rules when planning to implement a Terminal Server solution: Terminal Server need not be in a Windows NT Server domain to function, but without a domain architecture, users must have separate accounts on every computer running Terminal Server. This limits scalability and makes it more difficult to administer groups of users.

Consult your Windows NT documentation for more information on setting up Windows NT Server domains. Administrators can choose to add attributes that are specific to Terminal Server to user accounts. This adds a small amount of information, typically 1 KB or less, to each user's entry in the domain's Security Accounts Manager (SAM) database. This additional information is not necessary, but it allows the administrator to exercise additional control over individual user settings. Every Windows NT Server domain has at least one server that functions as a domain controller. We strongly recommend that you not run Terminal Server on any computer that is also a domain controller because of the resource load that Terminal Server places on the system. Also, because Terminal Server is designed to perform like Windows NT Workstation at the end-user level, the system will not assign top priority to critical domain-level processes such as user account replication, logon requests, logon script replication, and authentication requests. In addition, domain controllers cannot be cloned because the security identifiers (SIDs) will be duplicated across the cloned servers and will therefore be unable to join the domain.

An exception might be a company with no preexisting Windows NT Server domains that requires only a few servers running Terminal Server. If this company wants to use global groups to apply user policies and to create user accounts that can be used across multiple servers, it might be appropriate to install a server running Terminal Server as a domain controller rather than as a member server. Small organizations without many users typically use a single domain.

TCP/IP

In order for the Network Station to communicate with your servers, you need a TCP/IP network. If you understand your TCP/IP network, installing and configuring your Network Station and IBM Network Station Manager program is much easier.

DHCP

Dynamic Host Configuration Protocol (DHCP) is also a TCP/IP protocol. DHCP provides a way for a server to automatically allocate IP addresses and configuration information without forcing the administrator to record and track the MAC addresses of the networked computers. DHCP is capable of assigning either a permanent IP address or a temporary IP address for every host or Network Station within a predetermined range of IP addresses. It is also capable of assigning IP addresses either statically or dynamically.

DNS

A Domain Name server is a server whose responsibility it is to keep track of host names and IP addresses. Having an administrator manually update a list of names and addresses might be manageable in a very small environment with a somewhat low rate of change, but it quickly becomes unmanageable in large networks and in networks that have a number of mobile workers who move quickly from one location to another and need to retain the same name, yet have a different address every day or every week, or whatever might be the case. This is why a facility is required to allow a dynamic update to the list of names and addresses maintained by a Domain Name Server.

WINS

You can configure Terminal Server so that clients can connect to it using Windows Internet Naming Service (WINS). If you select this method for name resolution, you must register all running Terminal Servers with the primary and backup WINS servers.

Remote Access

Terminal Server can provide remote users with access to applications that would otherwise be unusable because of poor performance across dial-up connections (the screen, mouse, and keyboard information sent by Terminal Server typically uses less bandwidth than an application that must be downloaded and then run locally on a remote user's machine).

Flash Boot

The flash memory card support enables the use of a PCMCIA flash memory card to boot the IBM Network Station. Since the IBM Network Station has no disk storage devices, all the software required to make it operational must be loaded from a server. In environments where there is no local server, transferring megabytes of code over a network can take several minutes. In order to reduce the time needed to boot in these environments, the Network Station operating system and applications can be stored on a flash memory card. The flash memory cards supported are from a select subset of PCMCIA Series D type II cards (listed in the PRPQ documentation) and may be purchased from several third party vendors.

In addition to individual Network Stations each being able to boot from their own flash card, the offering also provides the capability for several Network Stations to boot from one Network Station which contains a flash memory card. This additional function is called "peer boot" or "buddy boot".

System Software

What is a Windows applications server? A Windows application server is a machine that executes Windows applications on behalf of clients that cannot run these same applications on their own processor. The client does not have to be a network computer, or an X-station, but it can be any machine, even one capable of executing Windows applications itself. A typical case for example might be an old PC, with a slow processor and limited local storage capacity. This PC might be adequate to run a 3270 emulator for example, which requires little local storage and processing power but once in a while it needs to execute an application that require a fast processor and large files. In that case, the PC can take advantage of a Windows application server and connect to the server when this application needs to be executed. This is also a good way to reduce the maintenance associated with these applications by making them available on a server; therefore, when it is time to upgrade these applications, it can more easily be done by upgrading a few servers rather than a much larger number of PCs.

Terminal Server system diagram

Microsoft® Windows NT® Terminal Server Edition, or WTS, Microsoft® Windows NT® Server 4.0, Terminal Server Edition is an extension of the Windows NT product line that provides support for remote access by using thin client software that runs on a new class of Windows-based terminals and on desktop systems running under 16-bit and 32-bit Windows. Terminal Server allows users to run both the Windows desktop operating system and Windows-based applications directly off the server, extending the scaleable Windows family and providing users of low-cost terminal devices and legacy hardware with access to the latest Windows NT based technology and the latest Windows-based applications. Terminal Server has three parts. The server itself is a new edition of Microsoft® Windows NT Server 4.0 with the ability to host multiple, simultaneous client sessions. Remote Desktop Protocol (RDP) is the protocol that allows a super-thin client to communicate with Terminal Server over a network. Terminal Server Client is a super-thin client application that connects to Terminal Server from a Windows-based terminal, Microsoft® Windows for Work groups 3.11, Microsoft® Windows 95 or Windows 98, or Windows NT®.

Citrix MetaFrame / WinFrame

Citrix MetaFrame is thin-client/server system software for Microsoft®'s Windows NT® Server 4.0, Terminal Server Edition. Citrix MetaFrame system software, which incorporates Citrix's Independent Computing Architecture

(ICA), provides a complete thin-client/server computing solution for multi-user NT 4.0 environments.

MetaFrame provides value-added functionality for all types of Windows clients including Windows 95, Windows CE, Windows NT® Workstation, Windows for Work groups and Windows 3.x systems. MetaFrame also supports non-Windows clients including DOS, UNIX, Mac OS, Java and OS/2 Warp and a broad range of client hardware including legacy PCs, Pentium PCs, Windows-based terminals, network computers, wireless devices and information appliances.

MetaFrame connects users to the network through standard telephone lines, WAN links (T1, T3, 56Kb, X.25), broadband connections (ISDN, Frame Relay, ATM), wireless connections, corporate intranets and the Internet. MetaFrame supports popular LAN and WAN protocols including TCP/IP, IPX, SPX, NetBIOS, and direct asynchronous connections. WinFrame is the predecessor to MetaFrame and is based on Windows NT® 3.51 platform. Both WinFrame and MetaFrame are supported with the IBM Network Stations.

NCD WinCenter

NCD WinCenter for MetaFrame is an add-on product for enterprises using Microsoft® Windows NT® 4.0, Terminal Server Edition and Citrix MetaFrame.

Highlights: Integrates security between NT and UNIX systems using NIS Optional NFS package to share files with UNIX servers Cut-and-paste between UNIX and Microsoft® applications Supports UNIX workstation floppy drives NCD WinCenter for MetaFrame uses the open systems X Protocol for display presentation so no additional desktop software needs to be installed on your UNIX workstations. This approach offers optional performance (for both UNIX and Windows applications) because it frees the UNIX desktop from locally running Windows emulation software, and gives your Windows applications a dedicated server.

IBM Network Station Manager - NSM

IBM Network Station Manager for Windows NT® Server 4.0 provides central client management for all (or to specifically designated) IBM Network Stations. These IBM Network Stations can be connected to a LAN or a WAN in which a PC Server (Boot Server or Base Code Server) running the IBM Network Station Manager code is an addressable node. Implement the IBM Network Station Manager for Windows NT® Server 4.0 software to take advantage of leading-edge application technologies such as Corporate intranets, the Internet, and Java With IBM Network Stations, you can access applications resident on attached PC Servers and on other servers on the network (for

instance, AS/400 ®, RS/6000, S/390 ®, and other systems) and to the myriad number of servers on the Internet as well.

The data and applications do not reside on the IBM Network Station. As access to applications is required by the IBM Network Station, the IBM Network Station Manager for Windows NT® Server 4.0 downloads the required code from the PC Server. Supported application access software includes 5250, 3270, X-terminal, NC Navigator, the IBM Network Station Browser, and Java running either within the Web Browser or within the IBM Network Station Java Virtual Machine.

The Boot Server may reside on one of the following platforms: PC Server, AS/400, RS/6000 and S/390. This document will only cover a PC based Boot Server implementation using MS Windows NT® 4.0.

We recommend that you install NSM on a Stand Alone Server. The current version of NSM for NT is Release 3.04.

Thin Client Devices

There are three IBM Network Station models. All IBM Network Station models are designed to: access multiple servers (IBM and others), run Windows applications via multi-user implementations of Windows NT, support 3270 and 5250 terminal applications and work with applications on AIX and UNIX servers using X-Windows server support.

Model 100

The Series 100 is an ideal desktop solution for users in multiple-server environments who need to access a variety of business applications even on different platforms. Organizations aiming to provide terminal users more access to contemporary business applications and e-mail at their desktops.

Model 300

The IBM Network Station Series 300 is the Internet network computer. It's the option for corporate Intranet and Internet access. It is the ideal solution when your desktop-computing focus extends beyond mainline business applications and data presentation. The Model 300 is ideal when users spend a lot of time on your corporate Intranet or the Internet.

Model 1000

The IBM Network Station Series 1000 is the Java network computer. The IBM Network Station Series 1000 offers robust support for running business-critical

applications and personal productivity tools that take advantage of Java. This IBM Network Station lets you run Java Applets and applications directly on the Network Station.

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