

The IBM NetVista Thin Client Family

From a technical point of view

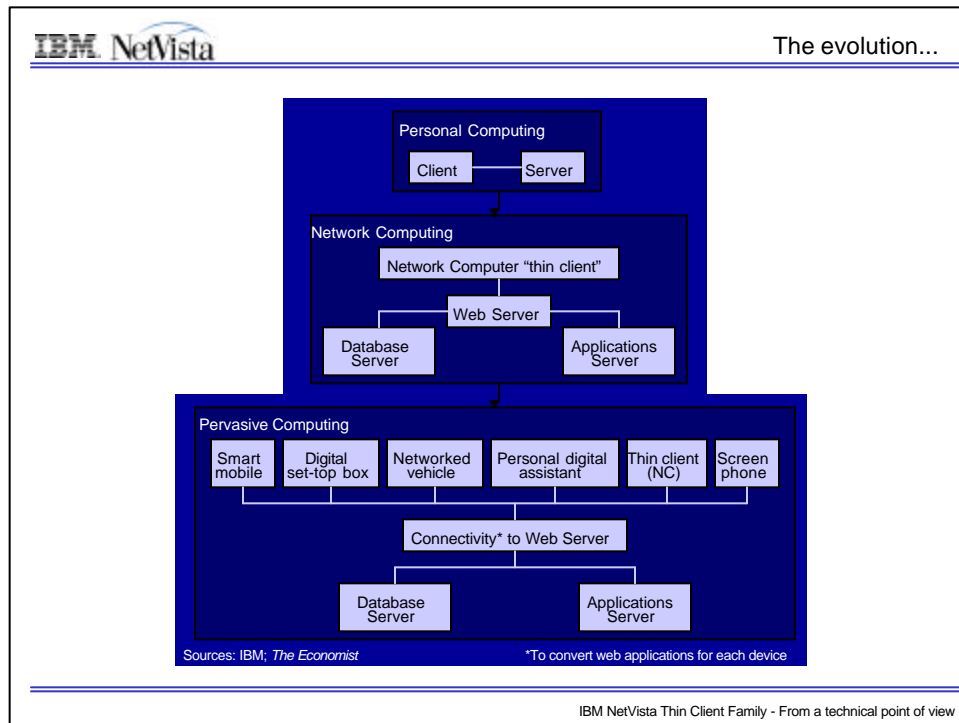
IBM PSG, Nordic



This presentation will give you an introduction to the IBM Thin Client Family. The presentation has a strong technical bias, but will try to explain the details so everyone can understand.

Topics

- > Why thin clients?
- > NT/Terminal Server, Windows 2000, Citrix Metaframe
- > IBM's thin client family overview
- > IBM NetVista N2200w - the Windows-based Terminal
- > IBM NetVista N2200 & N2800 with Thin Client Manager
- > Other IBM thin client offerings (TCM Express, Linux)
- > Positioning the IBM thin client offerings



This picture is taken from an article (written by IBM) in *The Economist*, September 1998. It shows where we stand today and where we are heading in the very near future.

Today, in the **Personal Computing** paradigm, most companies use a client-server computing model with fat PC clients and a wide range of servers (NT, Unix, mainframes etc.). In most of these companies, the PC clients are doing most of the work - and therefore has a huge amount of code installed locally - while the servers are merely database servers. In addition to taking care of the user interface, the clients also perform database lookups and processes the results. This is a very demanding task that require high performance PC's. As our demands grow the applications grow and we need to upgrade our PC's ever 18/24/30 months to cope with the latest applications. And the more code you need to manage on the client, the more expensive it gets...

What is happening in the next stage of the evolution is the **Network Computing** paradigm. Now we move the demanding data processing back to the servers in the network, and leave only the user interface part at the client, the thin client. Ultimately the user interface will be as simple as a browser. Software like Microsoft Windows NT/Terminal Server and Citrix Metaframe are being used as the migration path to allow coexistence of Windows applications. But evolution does not stop here. Computers are being used everywhere! **Pervasive Computing** (svenska: genomgripande) will give us computing power in our fridges, mobile phones, TV sets, cars etc. Since these new computers will have even less computing power and flexibility than thin clients, the servers have to take even more responsibility. And as these devices have very different display capabilities, the Web server will need to present the data in a way the client can display.

- Get applications out there - *faster!*
- Get *more* applications out there !
- Reduce *Total Cost of Ownership!*
- Take *control!*



One common problem in today's PC environments is that it is difficult to get new applications and upgrades out to all PCs that need them. Some PCs may even be mobile laptops, making them even harder to reach. When using thin clients, the applications run on the servers so they do not even have to be distributed to the clients!

As the company faces new challenges and need to react to customer demands, using thin clients makes it easier to get more applications to the users, assisting them in their job.

As the applications run on the servers, under administrators' control, it reduces the hassle the end-user experiences. When something is wrong, you know the administrators are already working on it, just like in the good old mainframe/terminal days!

Taken together, this all works to reduce the Total Cost of Ownership.

A thin client....

- is easier and less expensive to install / setup
- has a longer lifetime
- provides better security - no floppy - no viruses
- provides better ergonomomy - no fan
- takes up less desktop space
- not a target for theft
- has good graphics performance
- can use Metaframe for Terminals - less expensive
- can use Citrix Device Services - free-of-charge!

**A PC is a good choice when you....**

- have mobile users
- need both local and server-based Windows applications
- need advanced multimedia capabilities
- need external devices (floppy, CD, scanners etc.)



A thin client is a great choice for many purposes. It will not replace 100% of the PCs however. The ratio between thin clients and PCs varies between companies and between groups within companies, depending on their needs.

A thin client is built for network computing and needs no or a minimum of local software - thus it is easier to install.

As it performs less work, it lasts longer. All upgrades are done on the server.

Metaframe for Terminals is a version of Citrix Metaframe that allows **only** thin clients to connect to the NT/TSE-Metaframe server. Metaframe for Terminals is less expensive than Metaframe Enterprise.

Citrix Device Services is a software from Citrix/IBM that allows IBM thin clients to connect to NT/Terminal Servers via the ICA protocol - free-of-charge! More on this later.

A PC is a great choice for mobile users. However, all mobile users may not need a mobile PC of their own. Using thin clients in the office, the mobile users could share mobile PCs in a pool (like car sharing). When they leave the office their data is copied over to one of the available mobile PCs and when they come back the data is synchronized with the version in their home directory.

Some applications do not run well in a Terminal Server environment, using a PC with that particular application installed locally and an ICA/RDP client to connect to the server for all other applications is a perfect combination.

Video and audio capture, image processing (requiring many colors - high color depth) is not a task for a thin client. A PC is still the best choice.

Scanners, CD, floppy and other "exotic" external devices still fits best on PCs. PalmPilot/WorkPad type of devices do work on IBM's thin clients however.



**NetVista
Internet
Appliance**

- ✓ User optimized, designed for Web based solutions
- ✓ Hardware, software, services
- ✓ Broadband enabled



**NetVista
Thin Clients
N2200, N2800**

- ✓ Windows Terminal version 1.5
- ✓ Open source Linux version
- ✓ Preconfigured Flash install of Thin Client Manager that does not require a TCM server
- ✓ Server-managed TCM version that exploits TCM's server-management capabilities
- ✓ Zero footprint flat panel option for N2200



**NetVista
All-In-One System**

- ✓ Legacy reduced PC
- ✓ Space saving design
- ✓ Powerful desktop technology
- ✓ Professional image



**NetVista
Legacy Free System**

- ✓ New legacy free system
- ✓ Space saving design with innovative Workpad / Palm cradle
- ✓ Powerful desktop technology
- ✓ Access IBM key/icon
- ✓ New generation of operating systems



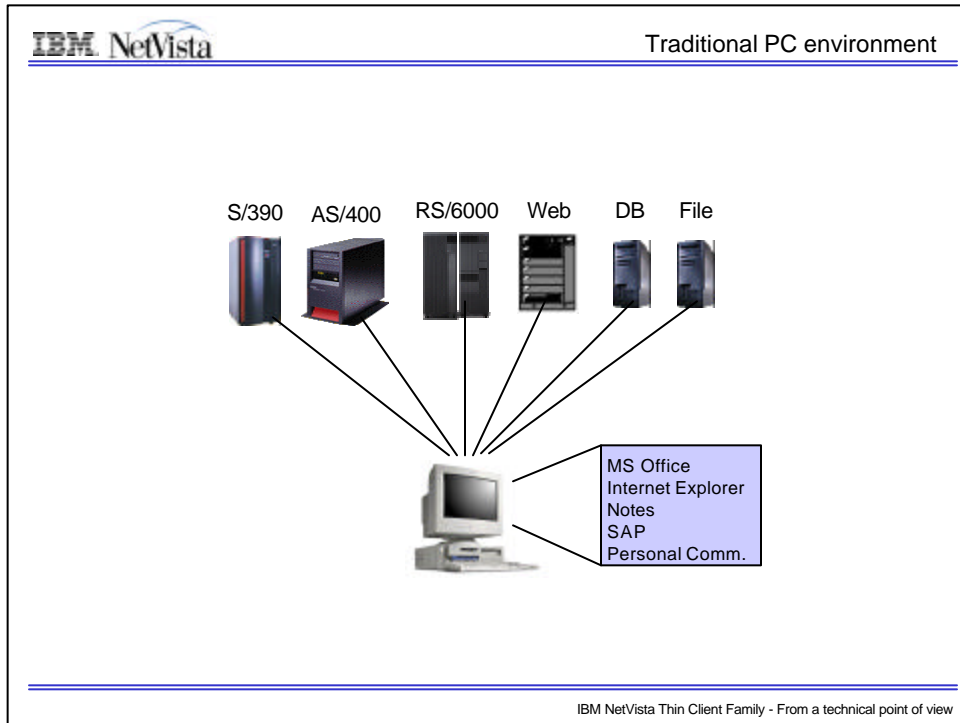
**PC 300
Traditional PC**

- ✓ Desktop, micro-tower, mini-tower form factors
- ✓ Variety of operating systems

The IBM Network Station family of thin clients have now been renamed and migrated into the rest of the IBM PSG product line. The new family name is **NetVista** (the eye to the net).

IBM can now provide a wide range of clients, spanning from the most simple Internet Appliance, providing only a browser, via thin clients, and up to high-performance PCs.

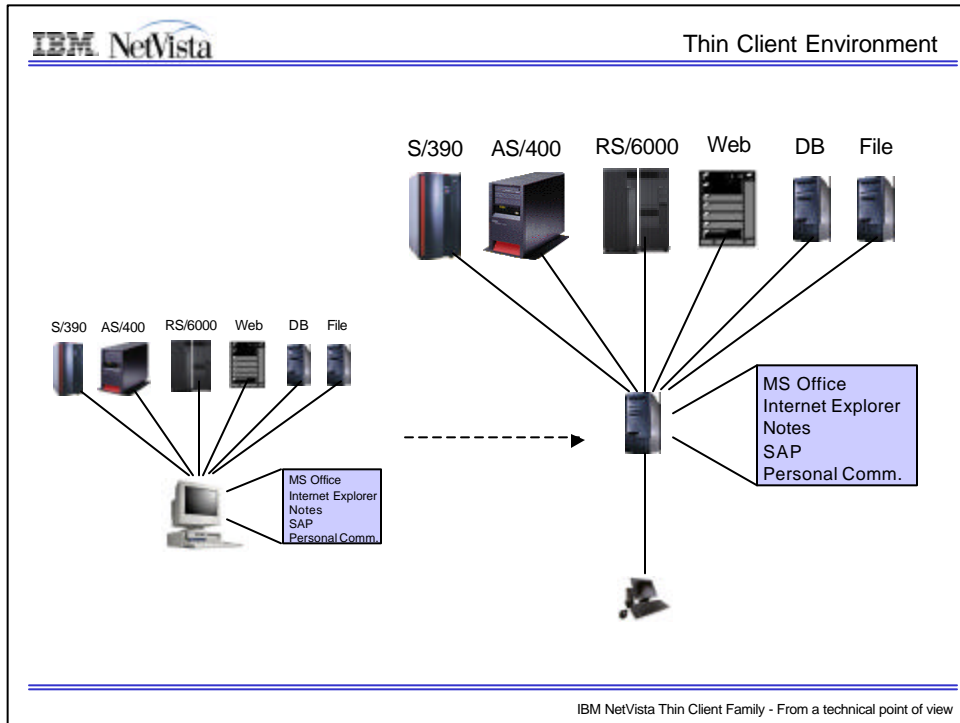
The PC era has proven that one size does not fit all (with PCs everyone needs the XXXL size...). Therefore it is important to choose a vendor that has devices for all needs. IBM is that vendor!



This is the traditional PC environment as we all know it. We all have our own copy of the software we need, installed locally on our PC's. Using those applications we access a number of server systems, ranging from the massive mainframes to smaller servers.

Having all software installed locally is an administrative nightmare. Even with the absolutely best management tools, it's still tricky and expensive to keep a large number of PC's up-to-date so everyone use the same version of the software and can access the right systems. Not to mention all the problems our ingenious users create for themselves when trying to tune their systems themselves...

Instead of having one copy each, wouldn't it be better to have only one copy that we all used? One copy to maintain, update & troubleshoot!



This is exactly what a thin client environment is all about!

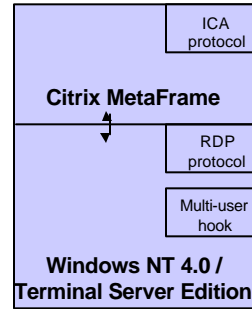
We move the software we use into a server that is capable of serving many users at the same time. We use exactly the same software as we had on our PCs in this so called NT Terminal Server. Then we give the user a small device, a thin client, that they use to connect to this server and work with their applications. For the end-user it looks exactly like their old PC environment, thus they require an absolute minimum of training. For the administrator it means that he can now concentrate on maintaining the servers and their software and not have to run around between the PCs to solve individual problems.

Windows NT 4.0 / Terminal Server Edition

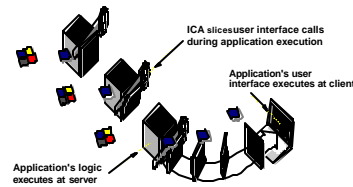
- ✓ A separate edition of Windows NT 4.0 Server
- ✓ Provides *multi-user* functionality in NT
- ✓ Users execute their Windows applications **IN** this server - using its CPU, memory and disks
- ✓ Provides the RDP protocol (RDP4)
- 1 NT server license per server
- 1 NT/TSE CAL per *physical* client HW

Citrix Metaframe

- ✓ Provides the ICA protocol
- ✓ Application publishing
- ✓ Shadowing - remote desktop control
- ✓ Local serial & parallel port mapping
- ✓ Audio
- ✓ Load Balancing add-on product
- 1 Metaframe server license per server
- 1 Metaframe client license per *active* client



x86 server



IBM NetVista Thin Client Family - From a technical point of view

Windows NT 4.0, Terminal Server Edition is the latest edition of the NT 4.0 Operating System (released summer 1998). In addition to doing file and print as a normal NT 4.0 Server, it gives the users the ability to LOG IN and EXECUTE applications ON this server. Each user is given their own "virtual NT machine" in this server, using the server's CPU, RAM and disks. This is called "multi-user NT".

RDP (Remote Desktop Protocol) is the protocol developed by Microsoft to deliver the screen images out to the client and to transport the mouse movements and keyboard data back to the server. RDP in NT/TSE is a LAN protocol, not suitable for WAN connections due to its high bandwidth requirements.

To connect thin clients to a NT/TSE server you need 1 server license per server and 1 client license per physical client.

RDP clients are available for thin clients, Windows 3.1, Windows 9X/NT4/2000. There is no RDP clients for Unix.

Citrix Metaframe is an add-on product to NT/TSE and provides many necessary functions that NT/TSE and the RDP protocol lacks. With Metaframe, you also get the ICA (Independent Computing Architecture) protocol, which is a more robust and proven protocol than RDP. ICA is more optimized than RDP and requires less bandwidth.

Application publishing allows a user to connect to an application (such as Word, Excel etc.) instead of connecting to a server. This is useful e.g. when a company needs to support multiple language versions of, say MS Office. One server can have the English version of Office and another server can have the Swedish version. The users can then connect to the application "English Office" instead of having to know which server IP address has the English version.

Metaframe also provides **Shadowing**, the ability to allow e.g. the help desk to take over the user's screen (remote desktop control).

Metaframe also supports use of **local external devices**, such as printers and scanners, via parallel and serial ports.

One, almost necessary, function in a thin client setup is **Load Balancing**, which Metaframe supports (but not NT/TSE) as an add-on. This allows companies to build server farms with multiple servers and when a user connects to an application (uses published applications) he/she is directed to the least busy server in the farm. It must be emphasized that it is **not** a fail-over solution, it is load balancing at logon only. If a server becomes unavailable, the users working on that server gets a black screen and has to restart. The Load Balancing function then redirects them to another, working, server.

To use Citrix Metaframe, you need the licenses for NT/TSE (as above) **plus** 1 Metaframe server license per server and 1 Metaframe client license per **logged-on** (simultaneous) user.


ICA clients are available for a wide range of platforms, including Unix.

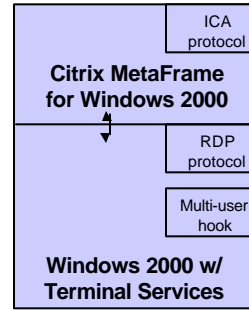
NOTE: Neither the RDP nor the ICA protocol currently supports more than 256 colors (July 2000).

Windows 2000 w/Terminal Services

- ✓ NT/TSE functions integrated into Windows 2000
- ✓ Provides the RDP5 protocol (enhanced)
- ✓ Shadowing
- ✓ Local parallel port mapping
- ✓ 'Trivial' Load Balancing (NTLB)
- 1 NT server license per server
- 1 NT/TSE CAL per *physical* client HW

Citrix Metaframe for Windows 2000

- ✓ Provides the ICA protocol
- ✓ Application publishing
- ✓ Shadowing
- ✓ Local serial & parallel port mapping
- ✓ Audio
- ✓ Load Balancing add-on product 
- 1 Metaframe server license per server
- 1 Metaframe client license per *active* client




x86 server

Windows 2000 Server has the multi-user functions from NT/TSE built-in as services you can choose to add at install time. The Terminal Services is therefore no longer a separate product.

Windows 2000 has a new, enhanced, version of the RDP protocol. This provides shadowing and local printer support. It also supports a type of load balancing. This load balancing technique measures the outgoing traffic on the network adapters in each server and redirects new requests to the least-network-busy server. It is primarily intended for e.g. web servers, file servers etc, where it probably works fine. In a thin client environment, however, the network load does not say very much about how busy the server is. For example, if users have disconnected sessions on the server, the server is still processing them, but it creates no network load at all for these sessions. Therefore the servers in the farm may not be evenly loaded, as with the Citrix Load Balancing function.

The RDP protocol in Windows 2000 is optimized both in terms of performance and bandwidth requirements compared to the RDP protocol in NT/TSE.

Citrix also has a version of Metaframe for Windows 2000, which provides the more intelligent and proven Citrix Load Balancing feature as well as the optimized ICA protocol.


Citrix Device Services - "Metaframe light"

Facts....

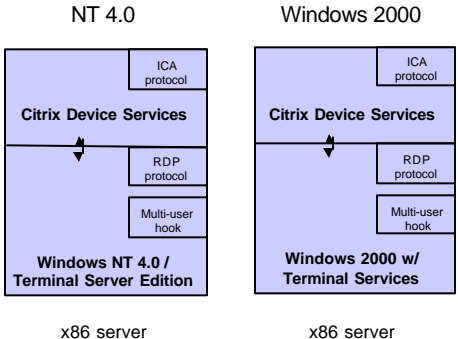
- ✓ Provides the ICA protocol
- ✓ Local serial & parallel port mapping
- ✓ Targets small businesses
- ✓ Provided by IBM

Pros....

- ✓ **Free-of-charge!**
- ✓ Supports the NetVista thin clients

Cons....

- ✓ No load balancing option
- ✓ No shadowing
- ✓ No audio
- ✓ Supports only the NetVista thin clients... no PCs



NT 4.0 Windows 2000

x86 server x86 server

A tip...

A trivial form of Load Balancing can easily be implemented using a Round-Robin DNS setup.

IBM NetVista Thin Client Family - From a technical point of view

For those customers who think that NT/TSE and the RDP protocol is not enough, but do not want to pay for the full Metaframe (Enterprise) version, Citrix has released a 'light' version of the Metaframe product, called Citrix Device Services (CDS). IBM ships this product to our IBM NetVista thin client customers **free-of-charge**.

CDS includes the optimized and proven ICA protocol. It allows mapping of serial and parallel local devices. It does not include audio, shadowing or application publishing support and it is not possible to add Load Balancing.

Also, CDS allows connections **only** from IBM NetVista thin clients. If you install CDS on a NT/TSE server, you can not connect PCs, Unix clients etc. to this server via the ICA protocol. You can, however, still use the RDP protocol in parallel with the ICA protocol.

Also, as Citrix Load Balancing is not an option, you could setup a Round-Robin DNS and get a trivial form of load balancing. When the first user asks for the server's IP address, the DNS responds with the IP address for the first server (server1). When the second user asks the DNS responds with the IP address for the second server (server2). When the third user asks, the DNS responds with the IP address for the first server again. This continues in an endless loop. You can of course have more than two servers. The drawback with this Round-Robin technique is that if one server becomes unavailable, the DNS will still respond with that server's IP address, and those users will not get a connection. Also, if one server is heavily over-loaded, it still gets new users, even if there are other servers with less load. But in many cases it may be a very good compromise, especially since the price tag is appealing....

Server hardware

- > 1 x PentiumII/450 CPU per 25 concurrent users
- > 64 MB RAM for NT/TSE+Metaframe base
- > 16-32 MB RAM per concurrent user
- > No more than 75-80 concurrent users per server
- > Plan for the fact that a server may be unavailable - add extra HW
- > Use 2 servers instead of 1, use 3 servers instead of 2....

Network load

- > Common figures for ICA are 20-30 kBit/s per active user

	ICA	RDP
MS Word 97 (text)	~ 8 kBit/s/user	~ 10 kBit/s/user
MS PowerPoint 97 (graphics)	~ 60 kBit/s/user	~ 220 kBit/s/user

Measured using:
 NT 4.0 TSE
 Metaframe 1.0
 Win32 ICA client
 Win32 RDP client

Note: These figures are *not* IBM official figures.

Sizing an NT/TSE-Metaframe server is a tough task! The amount of RAM and CPU power depends on what applications the users use, how they use them, how often etc. The recommendation is to run a quick pilot to verify that the applications do work and at the same time measure the network load and CPU and RAM requirements. The more users involved in such a pilot the better, but do not use less than 10 people.

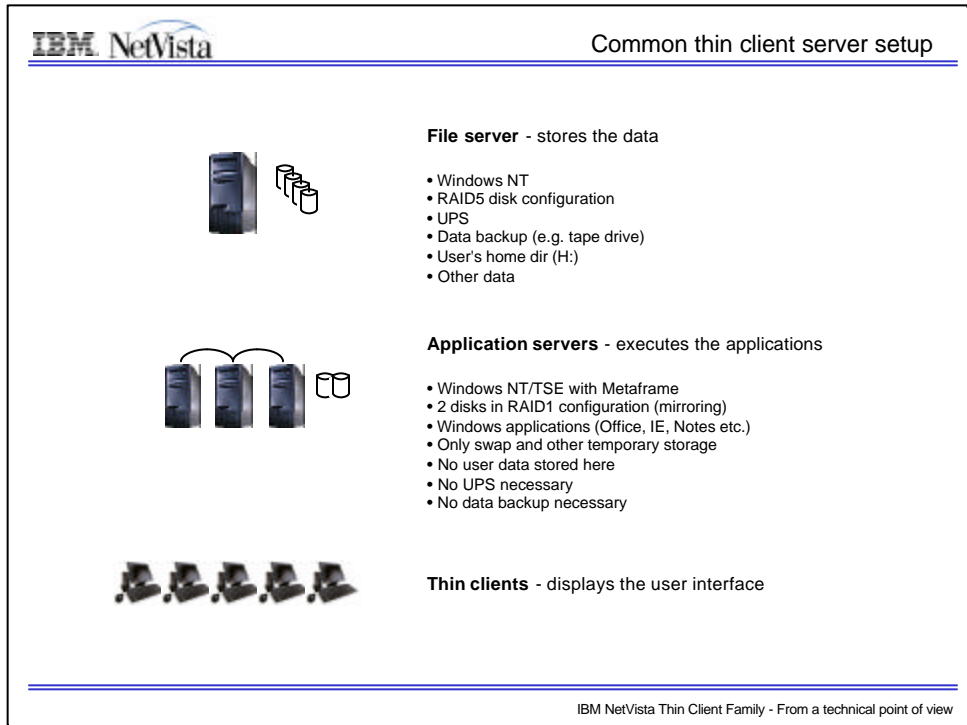
This slide gives some very generic guidelines for applications such as MS Office, Outlook, Internet Explorer etc.

The reason for my recommendation of no more than 75-80 users per server is that experience has shown that with more users the performance of the NT 4.0 kernel drops. It seems like the server gets too much 'administration work' in keeping track of all its processes.

An 'ideal' server is a 2xCPU server with, perhaps, Pentium III/600 and 2GB of RAM. A server like this can handle about 60 simultaneous users with good performance. The IBM Netfinity 4000R is a perfect server for NT/TSE-Metaframe server farms. Being only 1 unit high you can squeeze approximately 40 servers in one rack.

Network utilization is also difficult to predict, as it also depends on what applications are being used and how they are being used. Graphics intensive applications (Powerpoint, browser etc.) require much more bandwidth than text applications (Word).

The figures in the table is the result of a test I did using NT/TSE, Metaframe 1.0, ICA and RDP clients for Win32 (NT 4.0). Using a macro program I simulated the use of Word and Powerpoint during approximately 10 minutes each. Compression was activated in both the ICA and RDP client.



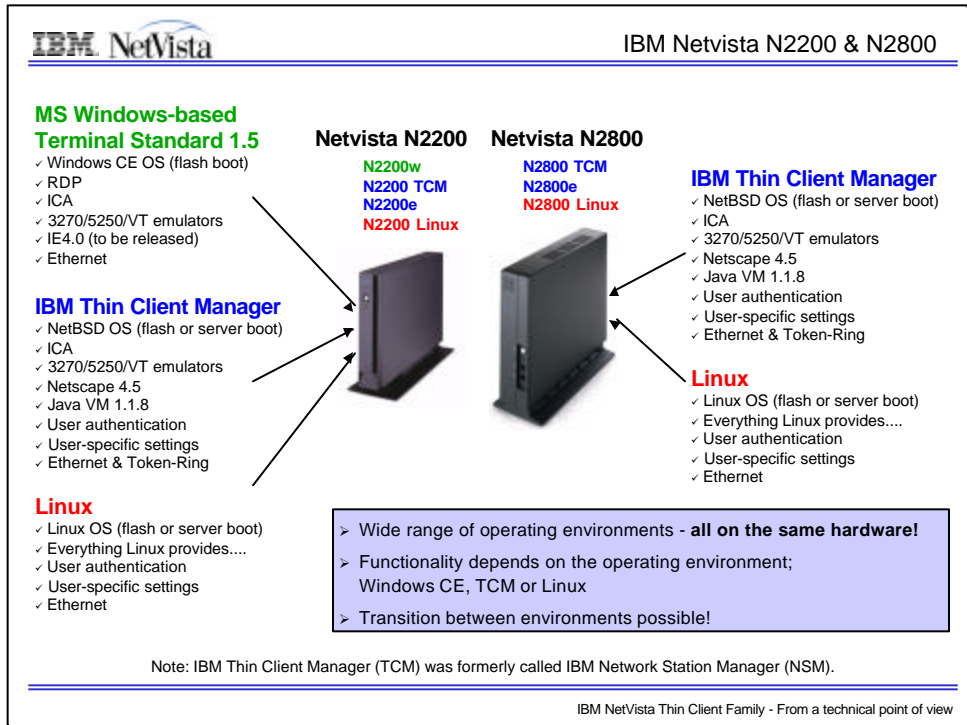
A thin client environment is best built using a 3-tier hierarchy.

The **top server** stores the users' data (their home directories). This is a normal file server, already in use by most PC networks. It should have a high degree of redundancy, such as RAID5 disks and backup systems.

The **application servers** execute the users' applications. They have NT/TSE-Metaframe (or Windows 2000-Metaframe) and all applications the users require installed. It is usually better to use more, but less powerful, servers. As these servers do not store any data, backup can be done by 'Ghosting' the servers so they can quickly be restored in case of a hard disk failure. It may, however, be a good idea to install dual hard disks in a RAID1 mirrored setup. The data is then written to both disks, improving redundancy if one disk should break, and increases performance as the data can be read from the least busy disk. For even better performance a RAID5 disk system could be used.

The swap file on the NT/TSE-Metaframe servers should be roughly 1.5-2 x the amount of RAM in the server.

One may think that these application servers require huge amounts of hard disk space, but they generally do not. A typical installation with NT/TSE, Metaframe, Office, browser and a few other applications usually require less than 1GB of hard disk space. To this add, say, 2GB for swap space and another 1GB for temporary user data and print spool files and you end up with a 4GB disk. Of course, the more applications you add the more disk space you need.



The IBM NetVista thin client comes in two basic hardware models, the N2200 and the N2800. The N2200 is available in three different shapes; as the recently announced N2200w - the Windows-based Terminal, the N2200 with Thin Client Manager or Linux and the N2200e - with Thin Client Manager Express.

The **N2200w** is the IBM Windows-based Terminal and comes with a flash card preinstalled with the latest version of the Windows CE operating system for thin clients, the WBT Standard 1.5. This provides emulators, RDP and ICA clients and soon also a stripped-down version of Internet Explorer 4.0. This environment has all software and configuration settings stored IN the client and is ready to run out-of-the-box.

The **N2200** is an N2200w without a flash card and it comes without any software. IBM provides - free-of-charge - the Thin Client Manager (TCM, former Network Station Manager) that can be downloaded from the Internet. This installs on a server (NT, AS/400, AIX) and then - after the client has booted from the server - provides the N2200 with emulators, ICA client, local Netscape browser and a Java Virtual Machine. In this environment all software and configuration settings are stored on the server, making it easier to administrate. The server also provides a login mechanism, making it possible to tailor an 'NC desktop' with icons and settings for each user, or group of users.

For those customers who do not want to install the TCM software on a server but still want the functionality of the TCM software, the **N2200e** - NetVista N2200 Express - is the perfect choice. This is a N2200 that comes with a flash card preinstalled with a subset of the TCM software. It provides emulators and ICA client and soon also a Netscape browser. By default there is no connection to a server (TCM server) as with the full TCM offering, so all software and configuration settings are stored IN each client. It is very easily, however, to connect this machine to a TCM server and start using the benefits of it. The N2200e is as easy to setup as the N2200w and provides an alternative to the WindowsCE platform.

For those customers who want Linux, IBM has - in cooperation with RedHat - certified RedHat Linux 6.1 to run on the N2200. The N2200 then boots off a Linux server much in the same way the N2200 does with TCM.

The **N2800** is the big brother of the N2200 and works with TCM and Linux (but **not** with WindowsCE/WBT Standard), and provides even better performance than the N2200 hardware. There is also a **N2800e** version that works like the N2200e.

A customer who buys the **N2200w** - the Windows-based Terminal - can install TCM on a server and then **very easily** migrate to and start using TCM with their N2200w terminals. The flash card in the N2200w is then not being used. If they want they can also use Linux instead of TCM. It is also possible to 'migrate back' to the WBT environment later, if desired.

A customer with only the N2200 hardware (N2200 or N2200e) can **not** migrate to WindowsCE/WBT on their hardware, due to licensing issues. To run WindowsCE/WBT the N2200w must be bought.

	N2200	N2800
CPU	x86/233MHz	x86/266MHz
RAM	32-288 SDRAM DIMM (One slot available)	64-256 SDRAM DIMM 512KB L2 Cache
Network	10/100 Mbit Ethernet 16/4 Mbit T/R*	10/100 Mbit Ethernet 16/4 Mbit T/R
I/O Ports	<ul style="list-style-type: none"> • 2 USB (only) -1 used for mouse/kbd -1 available: • Printers via USB-Parallel converter • Serial via USB-Serial converter 	<ul style="list-style-type: none"> • 2 Serial -Printers -Touch screen -SmartCard (GCR410) -Other serial devices • 1 Parallel -Printers • 2 USB
Expansion	<ul style="list-style-type: none"> • Compact Flash card 	<ul style="list-style-type: none"> • Compact Flash card • 2 PCI (short) -Quatech Multiport serial
Audio	<ul style="list-style-type: none"> • External speakers out • External microphone in 	<ul style="list-style-type: none"> • External speakers out • External microphone in

Hardware support depends on the operating environment used; Windows CE, TCM or Linux.

*IBM NetVista N2200w is Ethernet only.

IBM NetVista Thin Client Family - From a technical point of view

CPU speed is less interesting in the thin client world than in the PC world. Still it determines somewhat the performance of the thin client.

The N2200 (and of course also the N2200w and N2200e) has a 233MHz CPU, giving the N2200 (and N2200w) very good performance compared to other WBTs.

RAM upgrades may be necessary when you run more applications locally in the thin client. For example, running the local Netscape browser from TCM in the N2200 requires more than 32MB (64MB is fine). Running local Java applications in the N2200 also requires more than 32MB. <http://www.ibm.com/nc> has guidelines on RAM requirements with TCM.

The N2200 can be bought in TokenRing version (8363-Txx) or Ethernet version (8363-Exx). If you buy the TokenRing version, you can later unplug the TokenRing card and you get an Ethernet box (it has Ethernet on the motherboard). This is not possible with the N2800 (8364-Txx or 8364-Exx) which is either TokenRing or Ethernet and the box must be replaced to switch between them.

The N2200w **only** comes in an Ethernet version. There is no TokenRing version available.

The N2800 has a standard set of ports. Note, however, that TCM does not support the USB ports on the N2800 yet!

The N2200 (and N2200w) has **only** USB ports. Mouse/keyboard uses one, leaving one for external devices. What device you can attach depends on what you run on the client; Windows CE (N2200w), TCM (N2200 or N2200e) or Linux (N2200). As of today, July 2000, not very many USB devices are supported. Therefore the best bet is to use USB->Serial and USB->Parallel converters. www.ibm.com/nc has information on the tested and supported converter cables.

The N2200 has a standard PS/2 mouse which connects to the keyboard. The keyboard is a USB keyboard which connects to the USB port. The N2800 has standard PS/2 mouse & kbd.

IBM NetVista N2200w

Windows-based Terminal Standard 1.5



IBM NetVista Thin Client Family - From a technical point of view

On April 28, 2000, IBM launched its first Windows-based Terminal. Not only is this our first pure WBT offering, it is also the first WBT on the market to use Microsoft's new WBT platform, the Windows-based Terminal Standard 1.5.

The hardware in the WBT is the same as for the NetVista N2200 with a 16MB flash card added. This flash card has the Windows CE operating systems, ICA and RDP clients and emulators preinstalled.

- > IBM NetVista N2200w WBT Standard 1.5 is **first to market**
 - ✓ First to offer the benefits of WBT Standard 1.5 and RDP 5.0
 - ✓ Microsoft DirectX multimedia enabled - equal to Win32
 - ✓ Microsoft media streaming formats including MP3, WAV
 - ✓ ICA support for Citrix VideoFrame (Metaframe 2.0 in 3Q)
 - ✓ Fast set-up - no server software required for setup and configuration
- > IBM WBT 1.5 **outperforms** other WBTs
 - ✓ Optimized video device drivers for IBM's implementation of WBT 1.5
 - ✓ Proven performance of N2200 hardware vs. WBTs
- > Client-side WBT **Internet Explorer 4.0** browser ready
 - ✓ Offered within 90 days of availability of IE 4.0 for WBT Standard 1.5 (3Q)
 - ✓ Reflash existing card - no need to exchange/upgrade hardware!
- > Ability to **transition** to other IBM thin client environments
 - ✓ IBM Thin Client Manager or Linux
 - ✓ Help protect investment in IBM thin client hardware
- > Standard IBM NetVista N2200 hardware with **16MB Compact Flash** card factory-installed and pre-configured with WBT Standard 1.5
- > IBM NetVista N2200 hardware supports **64K colors**

First to market with RDP 5.0 - first thin client on the market to utilize the new enhanced functions of the Windows 2000 RDP protocol.

Citrix VideoFrame is a product that allows video publishing (like application publishing).

IBM has taken the standard set of video device drivers in the Microsoft Windows CE platform and replaced with drivers optimized for the N2200w hardware - giving the N2200w very good graphics performance. The N2200 also has a 233MHz CPU which helps to improve performance.

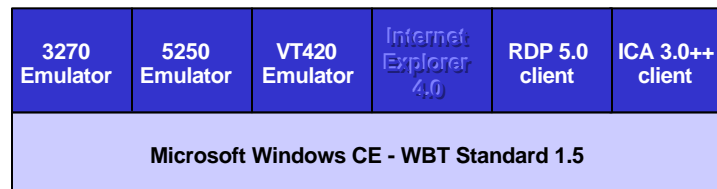
Microsoft will release a stripped-down version of the IE 4.0 browser for the Windows CE operating system. The N2200w is prepared to install this browser as soon as Microsoft makes it available. The current time schedule is release sometime during 3Q 2000. As the flash card in the N2200w is 16MB, it should have space enough to accommodate the IE4 browser without needing to upgrade any hardware.

A customer who has the N2200w hardware, can **easily** migrate to an IBM TCM or Linux environment if they would like to. No other WBT on the market has this opportunity!

Microsoft WBT Standard 1.5 software

- ✓ RDP 5.0
- ✓ ICA 3.0++
- ✓ 3270/5250/VT420 emulators
- ✓ Internet Explorer 4.0 (3Q 2000)
- ✓ Microsoft DirectX multimedia enabled (equal to Win32)
- ✓ MS Media Player
- ✓ Built-in SNMP functions
- ✓ Flash card software updates from HTTP or FTP server - at boot or on request

- All software installed locally on 16MB Compact Flash card.
- All configuration settings stored locally in each thin client.



IBM NetVista Thin Client Family - From a technical point of view

The base of the N2200w is Microsoft's latest version of the Windows CE operating system, packaged in the WBT Standard 1.5 platform. On top of this operating system the WBT can run (all software resides locally on the 16MB flash card, no network boot necessary):

- 3270 emulator for connection to IBM mainframe (S390)
- 5250 emulator for connection to IBM AS/400
- VT emulator for connection to Unix and Digital VAX/VMS systems via the VT protocol
- RDP client for connection to NT/TSE or Windows 2000 servers
- ICA client for connection to NT/TSE or Windows 2000 servers with Citrix Metaframe

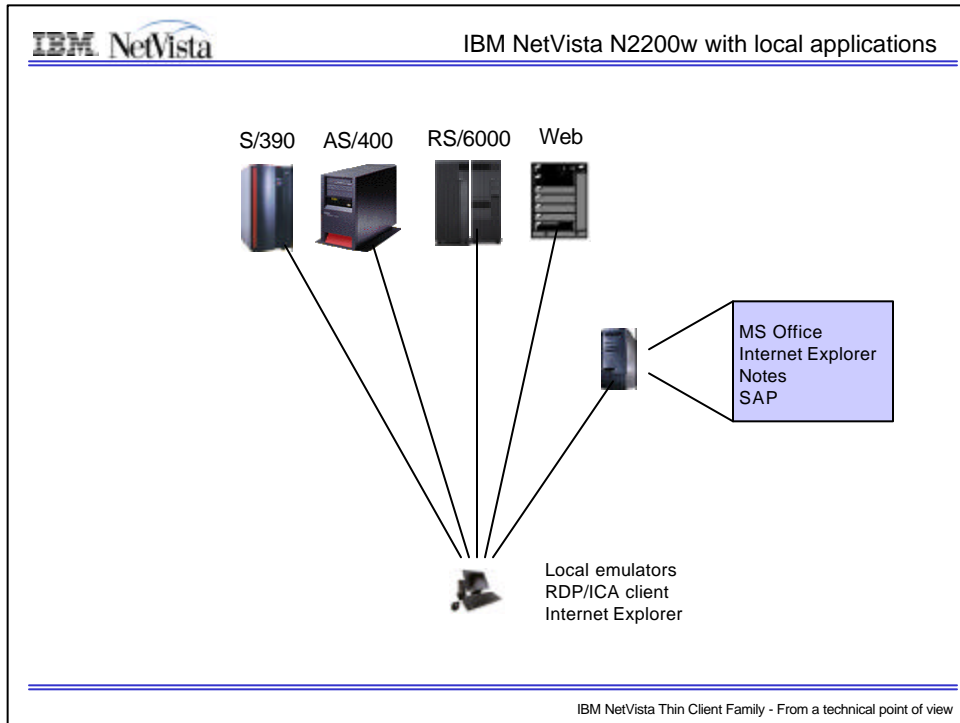
You are **not** limited to only one connection at a time, you can run e.g. the ICA client **at the same time** as you run a VT emulator session. The number of sessions depends on the amount of RAM (standard 32MB) in the box.

As Windows CE lacks windowing capabilities all sessions are displayed full-screen, thus you can not see the ICA client and the VT emulator on the screen at the same time. To switch between the active sessions you use a hot-key (Ctrl-Alt-UpArrow/DownArrow) combination.

MS is also developing a stripped-down version of the **Internet Explorer 4.0** browser for the Windows CE platform. IBM, as the first vendor on the market, intends to make this available for its N2200w customers within 90 days of MS releasing the code. Estimated delivery is 3Q.

New in the WBT Standard 1.5 platform is also enhanced multimedia support. DirectX and MS Media Player has been added to support multimedia applications and playback of audio and video.

To update the software on the 16MB flash card, the WBT can be configured to contact an ftp or http (web) server with the latest release. If the WBT finds out it is backlevel, it downloads the necessary changes and updates its flash card.



The IBM NetVista N2200w is capable of running both local applications (emulators and, soon, Internet Explorer 4.0) as well as RDP and ICA clients to connect to a Terminal Server. This gives us the ability to design flexible solutions that fit the customers environment.

By running simple applications **IN** the client we get a couple of benefits:

- Reduced network load - the 3270/5250/VT protocols require less network load than the ICA or RDP protocols. This is especially important if you have an environment with WAN links.
- Improved performance - since the client can connect directly to the S390, AS/400 or Unix host, the Terminal Server does not become a bottleneck. The reduced network load is also a major factor for improving the performance end-users experience.
- Improved redundancy - if the Terminal Server becomes unavailable the client can still connect to the business-critical systems in the host servers.

Of course, if the applications we use to connect to the host servers require anything else than an emulator session, we need to run them in the Terminal Server. One example is Client Access for AS/400 connections. If a customer uses features only available in Client Access, a local 5250 emulator is not sufficient.

- > RDP 5 - standard in Windows 2000 Terminal Services
 - ✓ Increased performance - WAN and LAN
 - ✓ Supports printing to the client (all printer drivers supported by Windows 2000)
 - ✓ Session shadowing
 - ✓ 'Trivial' Load Balancing function (NTLB)
 - ✓ 56-bit encryption

- > ICA 3.0++
 - ✓ Socks support
 - ✓ Citrix VideoFrame support (MetaFrame 2.0 in 3Q)

The N2200w is optimized for Windows access, to NT/TSE or Windows 2000 servers with or without optional Citrix Metaframe software.

The N2200w is the first WBT on the market to utilize the enhanced features of the RDP5.0 protocol, found in Windows 2000. This protocol gives:

Enhanced performance - less bandwidth requirements.

Printers locally attached to the client. All printer drivers supported by Windows 2000 are supported.

Session shadowing - remote desktop control, for help desks

A 'trivial' form of Load Balancing has been introduced in Windows2000/RDP5. The functionality is not as advanced or complete as Citrix Load Balancing, however. The Windows 2000 introduces a mechanism to measure the outgoing network load of the network adapters and to redirect incoming requests (RDP sessions) to the least-network-busy server.

The ICA protocol has been enhanced with SOCKS support for access through firewalls. Support for Citrix VideoFrame product is also added. VideoFrame allows video clips to be 'published' to clients, much like application publishing allows applications to be published.

The ICA and RDP clients support Cut/Copy/Paste within each session (so you can cut/copy/paste from e.g. MS Word to MS Excel running within the same ICA session), but not between sessions or into the emulators.

- > Emulators from FutureSoft
 - ✓ 3270
 - ✓ 5250
 - ✓ VT420
- > Cut / Copy / Paste between sessions
- > Keyboard remapping
- > Dynamically resized, scalable fonts
- > Local printing using HP PCL driver
- > Network printing using FutureSoft NetPrint (sold separately by FutureSoft)



For the WBT platform, IBM is licensing 3270/5250/VT emulators from Futuresoft. These are well-working basic emulators without too much "bells-and-whistles".

The emulators support Cut/Copy/Paste within each emulator session, but not between emulator sessions or into ICA or RDP sessions.

Local printing (screen dumps) can be done to local printers compatible with HP PCL.

For network printing support, an add-on software, FutureSoft NetPrint, must be used. The client then prints to a print server with NetPrint and the print server then forwards the data stream to the network printer.

- **Supported technologies**
 - ✓ Dynamic HTML (4.0)
 - ✓ Win32 Internet functions
 - ✓ Asynchronous pluggable protocols
 - ✓ URL monikers
 - ✓ MSHTML
 - ✓ WebBrowser control
 - ✓ MLang
 - ✓ ActiveX controls installed on the device (no downloads)
 - ✓ Cascading Style Sheets Level 1 (CSS1)
 - ✓ Full event model for all tags and objects
 - ✓ Integration of JScript (3.0) and objects
 - ✓ International Language Support (unicode characters)
 - ✓ Images (GIF, JPEG, BMP, XBM)
 - ✓ Multimedia (Microsoft DirectShow)
- **Plug-in support -- under evaluation**

Microsoft is currently working on a stripped-down version of the Internet Explorer 4.0 browser and plans to make it available for the WBT 1.5 platform shortly. IBM, as the first vendor on the market, intends to make this browser available for its N2200w customers in 3Q 2000.

The 16MB flash card in the N2200w has space enough to accommodate the browser, without needing to upgrade the hardware.

The browser supports most Internet standard features, as shown on this slide.

- **IE4 for WBT Standard 1.5 supports the same features included in the Win32 version, except for the following:**
 - ✓ Data Binding
 - ✓ Visual Basic Scripting Edition (VBScript)
 - ✓ Extensible Markup Language (XML)
 - ✓ Downloadable ActiveX controls
 - ✓ PNG image format
 - ✓ Microsoft Java Virtual Machine (JVM)
 - ✓ Gopher
 - ✓ Recreation Software Advisory Council on the Internet (Parental control)
 - ✓ Filters and transitions
- **No EMAIL support (Outlook Express not available for WBT 1.5)**
- **Microsoft JScript supports the same features included in the Win32 version, except for the following:**
 - ✓ RegExp support
 - ✓ SafeArray support (used for co-existence with VBScript etc.)
 - ✓ SCRRUN.DLL support
 - ✓ Automatic loading of type libraries
 - ✓ Referencing cross window objects

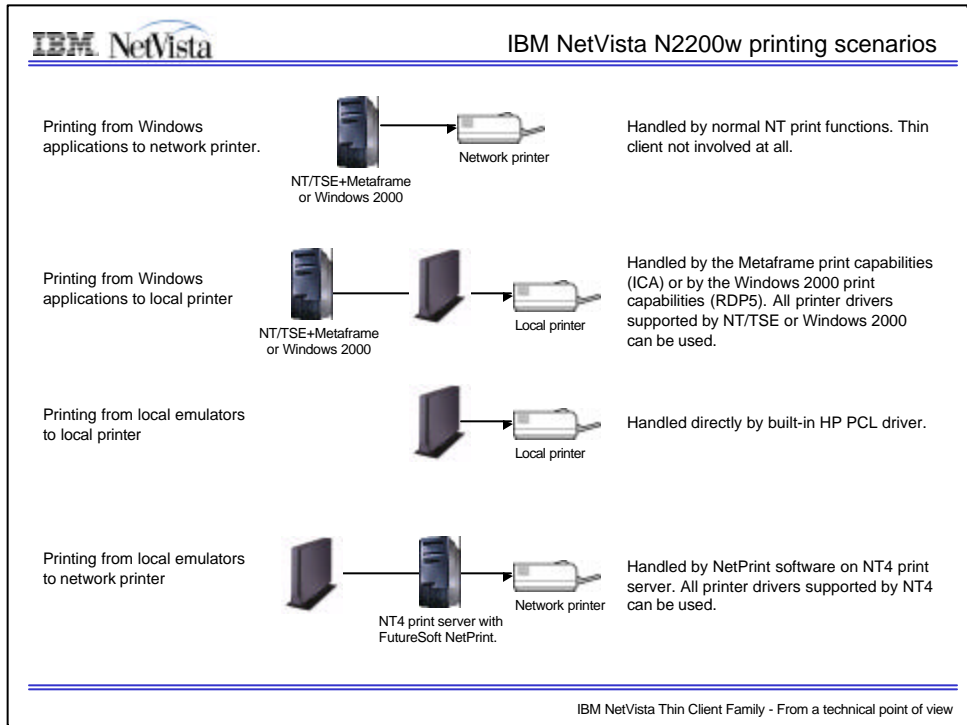
Note: As the WBT platform does not have a window manager, all windows are displayed full-screen, completely overlapping each other.

This slide lists the functions and features found in Internet Explorer 4.0 on the Win32 platform that are not found in the IE4 browser for WBT Standard 1.5 platform.

Also important to note is that the WBT Standard platform does not have a window manager. This means that all windows (emulator sessions, ICA/RDP sessions, IE4 browser windows) are displayed full-screen, covering the whole screen area, and overlapping each other completely. To switch between the windows the Ctrl-Alt-UpArrow/DownArrow key sequence is used.

This means that if a web page opens up a new window, it will completely overlap the other windows on the screen. Therefore it is very important to verify that the IE4 browser for WBT Standard 1.5 works with the web pages it is supposed to access. For Internet surfing, it may not always be suitable. It may, however, be the perfect, inexpensive, fit for basic browser applications not opening up multiple windows.

Note: This limitation is based on early information from Microsoft and may, or may not, change once the IE4 browser for WBT Standard 1.5 is released.



Some print scenarios:

- Printing from Windows applications on NT/TSE-Metaframe server to a network printer the NT/TSE server uses its installed printer driver, creates the print job and sends it off directly to the network printer. The thin client is not involved at all.

- Printing from Windows applications on NT/TSE-Metaframe server to locally attached printer the NT/TSE server uses its installed printer driver, creates the print job and sends it off, via ICA (or RDP5 in Windows 2000) to the thin client. The thin client receives the data and simply outputs it, untouched, to the local printer.

- Printing from a thin client LOCAL emulator (3270/5250/VT) to a local printer the emulator uses the print functions in the Windows CE platform to create the print job. The Windows CE platform has a pre-installed HP PCL printer driver that is used to format the data. The print job is then output to the local printer.

- Printing from a thin client LOCAL emulator (3270/5250/VT) to a network printer the emulator sends the data to print to a separate print server on the network.. This is an NT server running FutureSoft NetPrint software. The server uses the printer driver installed on the server to format the data and then sends it off to the network printer.

- Internet Explorer 4.0 browser
- Enhanced support for external devices
 - ✓ USB-to-serial modems for dial-up
 - ✓ USB-to-serial printers
 - ✓ Selected USB-connected printers
 - ✓ Selected USB-connected modems for dial-up
 - ✓ Selected USB hubs
- Enhanced management capabilities
 - ✓ Configuration clone-and-pull
 - ✓ Configuration clone-and-push
- Client properties lock-down
 - ✓ Password-protect local configuration settings

IBM intends to, in the near future, add the following features to the N2200w:

Internet Explorer 4.0 browser - 3Q

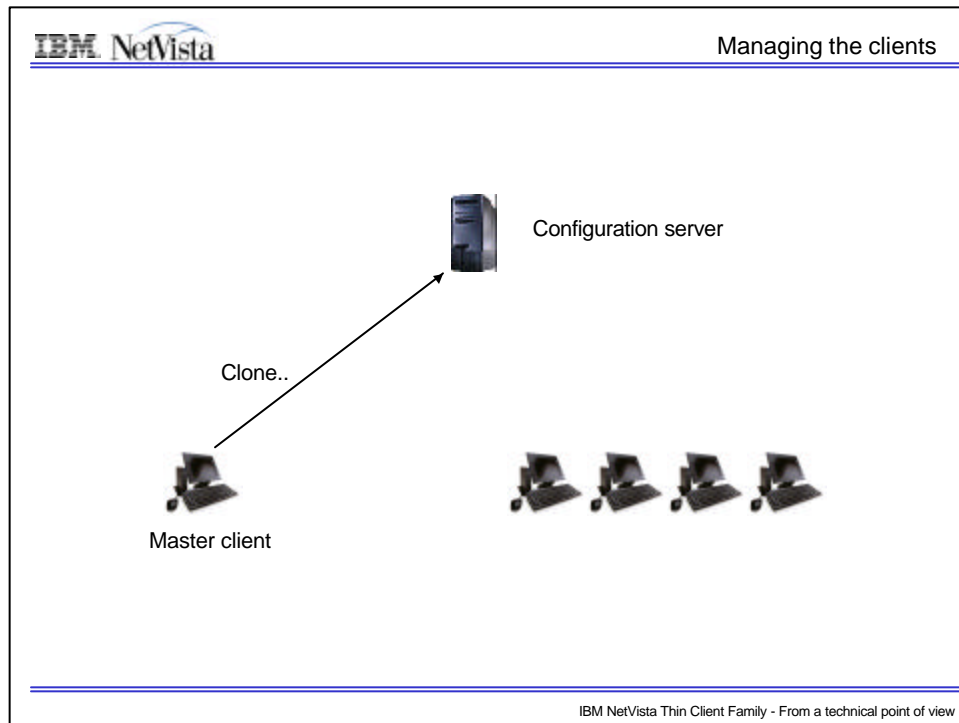
Support for more external devices. As of today (July 00) the only supported devices are USB-Serial (Belkin F5U103) and USB-Parallel (Belkin F5U002) cable converters. To these cables serial and parallel devices such as PalmPilots/Workpads and printers can be attached. In subsequent ServicePacks support for serial modems (via USB-Serial cable) for dialup, directly connected USB printers and modems and USB hubs will be added.

As all configuration settings for a WBT are stored locally in each individual client's NVRAM (Non-Volatile RAM) there must be a method for updating them, e.g. when you have installed a new application on a NT/TSE-Metaframe server and you want to publish that name to the client's "Connection Menu" or you have changed the IP address of a Unix host you communicate with etc. To do this IBM will enhance the capabilities of the N2200w with:

Configuration clone-and-push: This method allows an administrator to take a N2200w and manually reconfigure it to suit the new environment. The configuration settings can then be uploaded to an NT server and then be pushed out to all other N2200w units.

In addition to this, the capability to password-protect all settings in the NVRAM (IP addresses, data for "Connection Menu" etc.) will also be added.

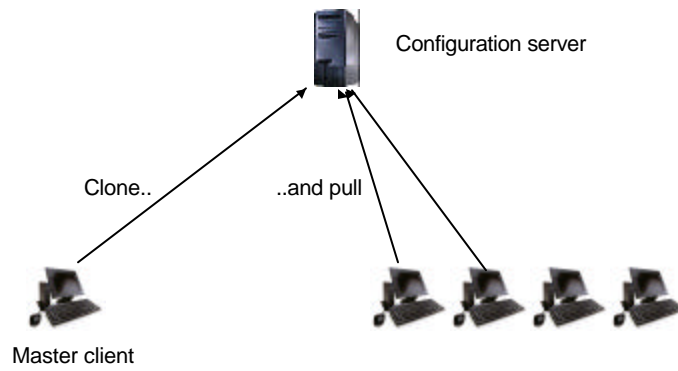
These enhancements will come in ServicePacks, available from www.ibm.com/nc, during 3Q 2000. When a software update is available from IBM the administrator should download it and install it on the internal ftp or http (web) server the clients connect to to see whether updates are available. It is then automatically downloaded by each client at power-on.



As specified by Microsoft's WBT specification, the N2200w has its software and settings stored locally IN the client. To keep the software up-to-date the IBM N2200w can connect to a HTTP or FTP server at each power-on and verify that it is using the latest release. If not, it downloads the files necessary and updates its flash card.

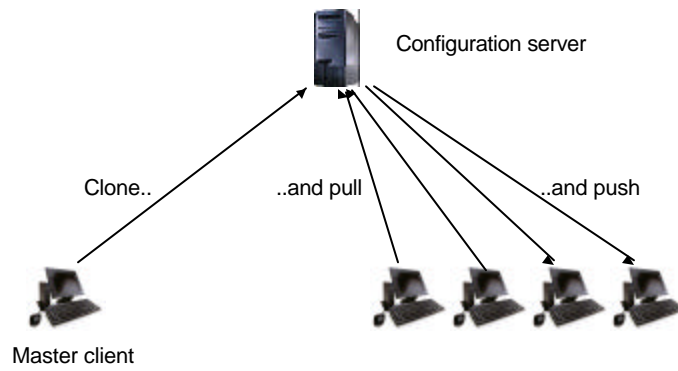
Settings, such as what Terminal Servers to connect to, what published applications to use, what emulator keymaps to use, which screen resolution to use etc. are also stored in the client. To facilitate distribution of these settings to all N2200w's in the network IBM has a technique called cloning.

The administrator takes a WBT and reconfigures it so it has all the settings appropriate for the environment. Then, he uploads these settings from the WBT to an FTP server in the network.



All the other N2200w terminals can then download these settings when they are powered on and be kept up-to-date.

We call this technique Clone-and-pull.



Soon to come is also a new technique called Clone-and-push. The administrator can then not only let the clients pull configuration data from the server, but also push the data out to each client.

- Get applications out there - *faster!*
- Get *more* applications out there !
- Reduce *Total Cost of Ownership!*
- Take *control!*



IBM
NetVista
N2200w



This ends the presentation of the N2200w - The Windows-based Terminal, optimized for accessing Windows NT/TSE and Windows 2000 servers.

IBM NetVista N2200 & N2800

IBM Thin Client Manager V2R1



IBM NetVista Thin Client Family - From a technical point of view

In addition to the IBM NetVista N2200w - WBT Standard 1.5, IBM has a very complete software package offering for its line of thin clients, called the IBM Thin Client Manager (formerly called IBM Network Station Manager, NSM).

TCM runs on both the N2200 and N2800 hardware (and also the older S300/S1000 boxes).

TCM is free-of-charge, available from www.ibm.com/nc.

Centrally managed

- > All setting stored centrally - nothing on the client
- > User authentication during bootup
- > User-customized desktop, easy to lock-down
- > Users can move between TCM clients and receive their own customized desktop wherever they are
- > Highly customizable - kiosk/supressed login, full-screen applications etc.
- > Network server boot or local boot (flash card) - also peer boot
- > Windowed environment



Configuration server



Boot server



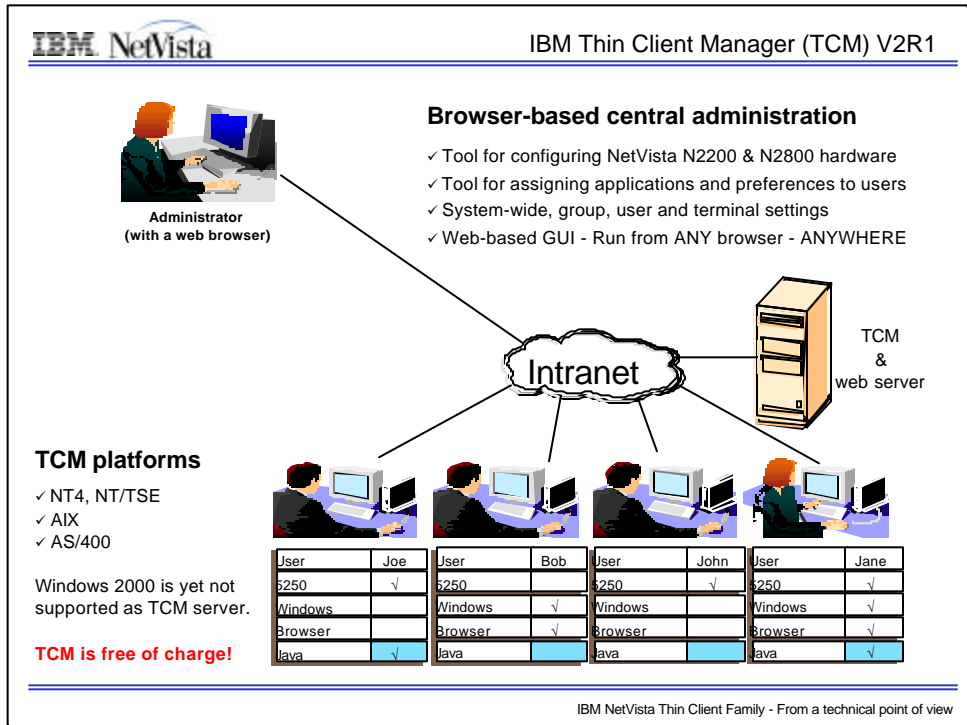
For those customers who require an even more centrally managed solution than the N2200w WBT, the TCM offering is the perfect choice.

By keeping all settings in one central copy (not in one copy residing in each physical client) management becomes even easier.

As TCM also uses an initial user logon, it is possible to provide each user with its own customized desktop. This desktop can display icons for the host systems (mainframe, AS/400, Unix, NT/TSE etc.) the user can access. It does not control what icons are displayed within the ICA session (on the NT/TSE servers). These are still managed as per normal Windows NT methods.

TCM is an extremely customizable environment! It can be setup to log the clients on automatically and autostart a browser session to a special homepage, or to look like a WBT, or to provide a user customized desktop with icons for only the systems the user is allowed to access. However, due to its high level of flexibility, it is also somewhat more complicated to get started than with the simple N2200w WBT.

The TCM operating system has a window manager (WM) that allows multiple windows to be displayed on the screen simultaneously. This makes it possible to run an emulator session and the ICA client at the same time and display them both on the screen. Each window is displayed within its own frame and they can be moved with the mouse.

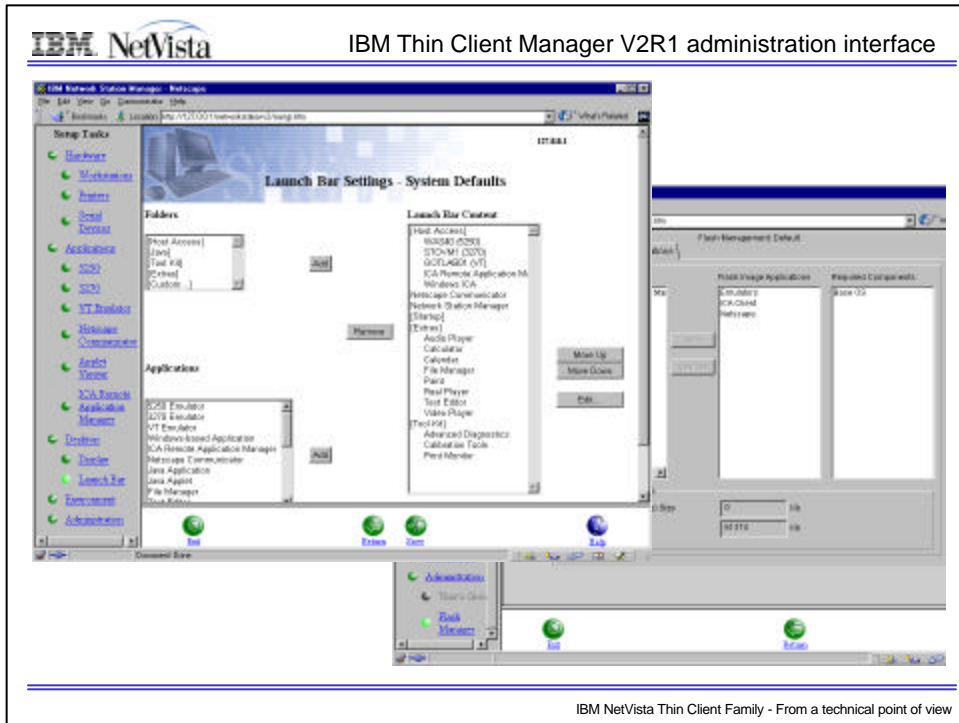


TCM consists of:

- the **boot code** (operating system, NetBSD) the N2200 and N2800 uses when running TCM.
- the **local applications** (3270/5250/VT, ICA, Netscape, Java) the N2200 and N2800 is able to run when using TCM.
- a central web-based **management tool** for configuring the N2200 and N2800 hardware and the settings for the local applications (e.g. what hosts to communicate with, keyboard mapping, color mapping etc.). All settings are stored in one copy in one central location, on the NSM server, in contradiction when using a WBT where all settings are stored in each individual client.

TCM is available for Windows NT 4.0 (and NT/TSE), AIX and AS/400. Windows 2000 support is currently being developed.

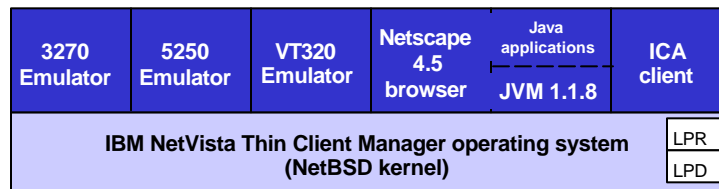
As the boot code and settings are stored on a server when using TCM, the N2200 and N2800 thin clients boot from the TCM server, over the network. Thus there is no need for a flash card in the thin clients when using TCM. This allows for even more central management of software and configuration settings. In some environments (especially when the TCM server is on the other side of a WAN link) it is necessary to boot locally for performance reasons, and TCM then supports the adding of a flash card to the thin clients. The boot code is then installed on the flash card (thus resides in the client) but the configuration settings are still kept in one central copy. The code on the flash card is managed by TCM. If one thin client has a flash card installed, it can act as a boot server for other thin clients on the same LAN (recommended number of "peer-booting" units is no more than 10).



IBM NetVista Thin Client Family - From a technical point of view

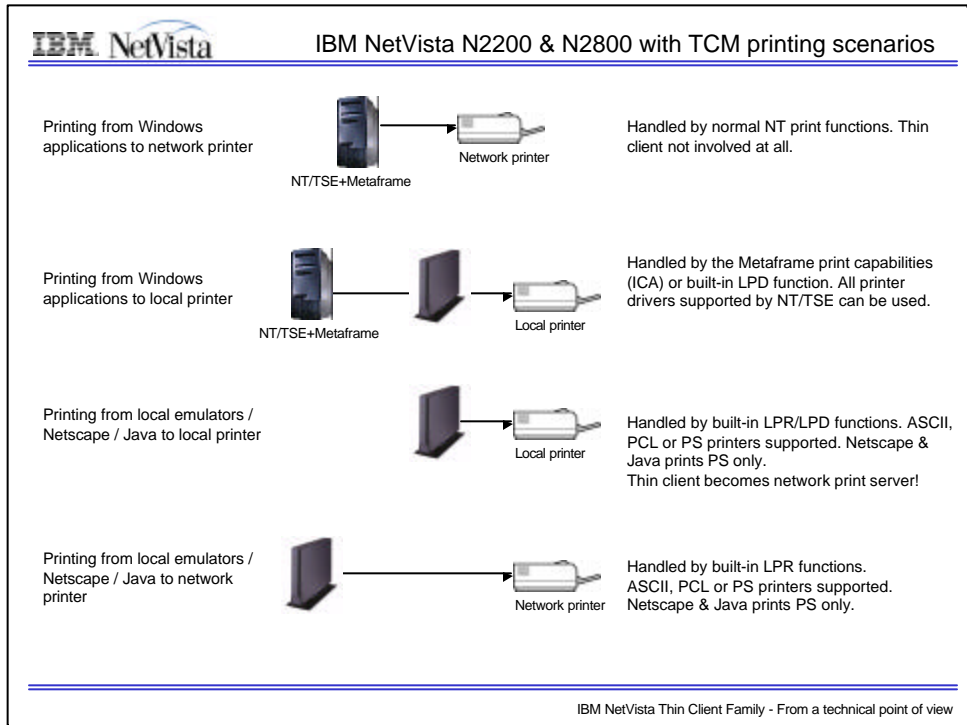
These screen shots show what the TCM management dialogs look like. Using a web browser, the administrator browses to the TCM server, logs on, and can then administrate the clients. Since TCM is browser-based no special management software needs to be installed at the computers where the administrator may be, a browser is all it takes.

- > ICA client
- > Emulators
 - ✓ 3270
 - ✓ 5250
 - ✓ VT320
- > Netscape 4.5 browser w/ built-in JVM
- > Separate IBM Enhanced 1.1.8 JVM
- > Audio & Video player
- > RealAudio / RealVideo player
- > PDF Viewer
- > Local LPR / LPD print functions
- > Cut / Copy / Paste between all local applications (even into ICA window!)
- > 64K color support



When running TCM, the N2200 and N2800 thin clients use a different operating system with completely different capabilities than the N220w WBT (that runs WindowsCE). The operating system is a small light-weight Unix kernel called NetBSD (V1.3). On top of this emulators (3270/5250/VT), Netscape 4.5 browser, Java Virtual Machine (Java engine) and ICA client can run. There is no RDP client available for TCM, thus Metaframe (or CDS) is required for NT/TSE access. To allow the Netscape browser to play back audio and video clips basic audio and video players are available, as well as a rudimentary PDF viewer for displaying Adobe Acrobat PDF files.

By providing an LPD (Line Printer Daemon) the thin clients running TCM can act as network print server. This allows them to receive and print jobs from all other devices that complies with the TCP/IP printing standard. For example, a Terminal Server could bypass the ICA protocol and print to a local printer on the client. An AS/400 could print lists to a printer locally attached to the client etc.



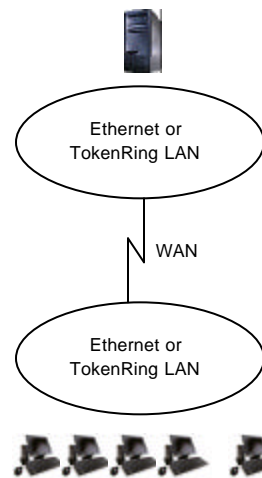
Printing from an IBM thin client running TCM is similar to the N2200w running the WindowsCE/WBT environment.

The first two scenarios are identical, the server generates the print data stream and sends it to a network printer or to a printer attached locally to the thin client. As TCM includes an LPD (Line Printer Daemon) function, the thin client actually becomes a TCP/IP print server and can receive print jobs from any host using TCP/IP printing.

When printing from applications running locally in the thin client, print jobs can be sent either to a local printer or a network printer. As the applications running locally are responsible for generating the print data stream only a few generic printer drivers are included. The emulators supports ASCII, PCL and PostScript printers. The Netscape browser and Java environment only supports PostScript printers.

One major difference between the N2200w environment and the TCM environments is that when printing from local applications to a network printer, the TCM environment does not require any separate print server. Instead, the local applications generates the print data stream and (using TCM's LPR, Line Printer Requester) sends the data directly to the printer. The printers supported are the same as above.

Technical note: If you experience poor performance with printing, check your DNS setup. Performance may improve significantly if the thin client can do hostname and IP address lookups of itself, the boot server, the printer etc.

**Configuration & authentication server**

- After boot-up, configuration settings are retrieved from the central configuration server.
- User is authenticated (can use kiosk, suppressed login) and a user-customized desktop is downloaded to the NetVista thin client.
- Keep central for ease of administration.

Boot server

- Provides the TCM operating system files, emulators, ICA client, JVM, Netscape etc.
- Distribute in the network for good performance.

A NetVista N2200 or N2800 with a Compact Flash card can act as boot server (peer boot) for other NetVista thin client terminals. TCM manages the software updates.

This slide describes what happens when a user powers on the thin client with TCM (N2200 or N2800).

The first step is that the thin client boots. During this phase it downloads its operating system. Normally this is done from a boot server (NT, AS/400 or AIX box) on the network. However, in some environments it is not suitable to have a boot server on each network, and then you can install a compact flash card in one thin client. This thin client then boots locally (from itself) and other thin clients can boot from it. The code on the flash card is managed by the central TCM server. We recommend no more than about 10 thin clients peer-booting from the one with the flash card.

After boot, the thin client connects to a central TCM configuration and authentication server. From this server the thin client downloads its configuration files that determine what it should do and look like after it has booted. Normally, the thin client displays a logon screen, but this can be suppressed (it then performs an automatic logon using a pre-defined userid/password) or the thin client can be configured for kiosk mode, where one single application (for example, the browser) is automatically started and used.

If a user logs on, the thin client downloads the user's NC Desktop data, with icons for the host systems and applications the user is allowed to access. This logon sequence does not log the user into his Windows environment, and the icons are not Windows applications, they are thin client applications. One of the icons could be "Windows", that launches the ICA client and takes the user into the Windows environment, running on NT/TSE-Metaframe servers.

As the user's NC Desktop is stored on a central NSM server, the user can logon to any thin client in the network and receive his own desktop. Thus, the icons displayed are not tied to one physical thin client, but rather to the person who uses it for the moment. This is not possible to do with a Windows-based Terminal.

- Get applications out there - *faster!*
- Get *more* applications out there !
- Reduce *Total Cost of Ownership!*
- Take *control!*



IBM
NetVista
N2200 / N2800



This ends the presentation of the Thin Client Manager offering for IBM's thin clients. TCM is an extremely customizable solution that provides a highly centrally managed environment combined with a strong application flora.

IBM NetVista Thin Clients

Other offerings



IBM NetVista Thin Client Family - From a technical point of view

The next few slides describe some other IBM thin client offerings:
TCM Express - TCM preinstalled on a flash card
NetVista for Linux - when you customer wants a Linux solution
N2200 Zero Footprint Option - when desktop space is important

Thin Client Manager on a Compact Flash card - ready to run!

- NetVista N2200/N2800 with Compact Flash card pre-installed and pre-configured with a subset of Thin Client Manager software
 - ICA & emulators only
 - Requires no TCM server - all code and settings on the flash card
 - Easy to setup - follow the wizard - as easy as a WBT
 - Can easily migrate to server-based solution once a TCM server is installed
-
- Future enhancements - Netscape 4.5 browser, modem dial-up
 - IBM 1.1.8 JVM possible to download to flash card
 - Bookmarks etc. are stored in a re-writable area on the flash card

N2200e



N2800e



IBM NetVista Thin Client Family - From a technical point of view

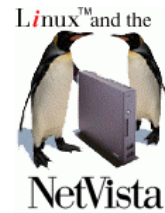
To make it easier for customers to get started with the IBM NetVista N2200 and N2800 thin clients running TCM, IBM has announced a Compact Flash card with TCM already installed. Just power-on the client and follow the on-screen wizard to setup the user desktop with icons for the hosts they should access.

When a more centrally managed environment based on TCM is required, just install a TCM server (NT, AS/400 or AIX) and load the configuration settings from it.

This is the perfect solution to show TCM's capabilities without having to setup TCM servers. With TCM Express it is as easy to setup as a WBT.

Part numbers are: N2200e - 8363-Cxx, N2800e - 8364-Cxx

- > Standard RedHat 6.1 Linux distribution
 - ✓ certified by IBM to run on the NetVista N2200 and N2800 hardware
 - ✓ not an IBM Linux distribution
- > Boots from Linux server or Compact Flash card
- > Targets customers with Linux skills
- > Supported by RedHat and "open source community"
- > Installation instructions and general guidelines provided by IBM website
- > Supports all Linux applications compatible with RedHat 6.1 and NetVista hardware
 - ✓ Netscape Communicator
 - ✓ Adobe Acrobat PDF viewer
 - ✓ Macromedia Shockwave
 - ✓ RealAudio / RealVideo
 - ✓ MP3 players
 - ✓ etc. etc. etc



As the N2200 and N2800 boxes are built on industry-standard x86 architecture, they are fully capable of running Linux. However, IBM does not offer a Linux distribution itself, but rather instructions on how to enable the thin clients to run distributions from Linux vendors. The Linux distribution currently enabled is the RedHat Linux 6.1 (other distributions are being certified). On IBM's thin client Web site (www.ibm.com/nc) are instructions on how to build a Linux kernel for the thin clients and make them boot from a Linux server. The web site also contains a discussion forum, tips and frequently asked questions about Linux on the thin clients. Apart from this, IBM does not provide any support on Linux for thin clients. Software defects should be reported to RedHat.

The N2200 and N2800 client can boot Linux either from a Linux server (network boot) or from a Compact Flash card in the box itself. IBM provides a flash cut tool that assists the administrator in building the flash card image.

Once the N2200 and N2800 boxes are booted with Linux, they can run all the popular Linux applications such as latest Netscape Communicator (with plug-ins for e.g. Macromedia Shockwave), Adobe Acrobat Reader, StarOffice etc.

The Linux offering for IBM thin clients targets customers with Linux skills.






Zero Footprint Option

- > Brackets to attach N2200 to IBM T55 flat panel screen
- > Prolongs client life vs. integrated solution
- > Maximum flexibility

IBM provides mounting brackets to attach a N2200 thin client to IBM flat screens. This solution requires less desktop space than two separate units and also allows flexibility in replacing the units individually.

IBM NetVista Positioning the NetVista N2200 and N2800 thin clients

 <p>N2200w</p> <p>Server-based applications Simple web-based applications</p> <ul style="list-style-type: none"> ✓ Optimized for Windows access ✓ ICA and RDP ✓ Emulation ✓ IE 4.0 browser ✓ Easy to setup 	 <p>N2200 with TCM or Linux</p> <p>Server-based applications Web-based applications</p> <ul style="list-style-type: none"> ✓ Windows access ✓ Emulation ✓ Light-medium browsing ✓ Light Java ✓ User-customized desktop ✓ Fully centrally administered 	 <p>N2800 with TCM or Linux</p> <p>Enhanced/interactive web apps Integrated business applications</p> <ul style="list-style-type: none"> ✓ Windows access ✓ Emulation ✓ Demanding browsing ✓ Demanding Java ✓ User-customized desktop ✓ Fully centrally administered
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> Transition between environments possible!

IBM NetVista Thin Client Family - From a technical point of view

As IBM has a wide range of thin client offerings, it is important to give some positioning guidelines.

For those customers that mainly run Windows applications, the N2200w is the ideal box. It is the only box to provide the RDP protocol, should the customer want to access NT/TSE or Windows 2000 Terminal Services without Metaframe. It has a set of basic emulators (3270/5250/VT) for host access. Microsoft will release a version of the IE4 browser, which IBM will add to its offering, making the box suitable also for simple web-based applications without requiring access to an NT/TSE or Windows 2000 server.

For customers requiring simple client-side Java, user-customizable desktop with individual icons, full central administration and management the N2200 with TCM offering is a good solution. It provides ICA client and emulators (3270/5250/VT) for accessing host systems and the Netscape browser for light to medium browsing.

For more demanding Java applications and browser requirements the N2800 box is probably a better fit than the N2200. Its more powerful processor provides better performance than the N2200. The N2800 also has a full set of I/O ports (serial, parallel, mouse, keyboard) while the N2200 only has USB ports (one available). So for extensive device attachments, the N2800 is probably the best fit.

Both the N2200 and N2800 boxes supports Linux, which (with the right skills) can be tailored to provide a very user-customized environment.

Note: Only if you originally bought the N2200w will you be able to downgrade do it. For example, you can upgrade from the N2200w to N2200 with TCM and then back to the N2200w. But if you initially bought the N2200 you can not downgrade it to the N2200w, due to licensing issues.

N2200w WBT advantages

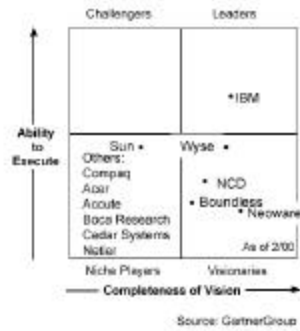
- + Easy to install - no server software necessary
- + RDP protocol supported - does not require Citrix Metaframe
- + Internet Explorer 4.0 browser (3Q)
- + Can be upgraded to N2200 with TCM or Linux
- + Behaves like Windows, anyone can set it up

N2200 with TCM advantages

- + Centrally stored software and configuration settings - fully centrally managed
- + Client-side Java; Netscape 4.5 and IBM JVM
- + Full-function emulators
- + User-individual NC Desktop and settings - wherever they log on
- + Windowed environment
- + Highly customizable and flexible solution; e.g. kiosks
- + If using DHCP, easy to rollout once the TCM servers are installed

- > Wide range of thin client offerings to suit all needs
- > Strategic partnerships with Microsoft and Citrix
- > Long presence in the thin client market
- > Clear long-term strategies
- > World-wide presence with sales and support
- > Can supply everything from network, thin clients, servers, monitors to services and financing

Thin-Client Desktop Vendors



For the fourth year in a row, rated the *only* vendor in GartnerGroup's 'magic quadrant'

IBM proudly presents..... The Gartner Group Magic Quadrant!

For the fourth year in a row, IBM has been rated the only vendor to fit into Gartner Groups Magic Quadrant. No other thin client vendor in the market has yet been able to provide such long-term strategies as well as ability to execute their strategies to be placed in the Magic Quadrant by Gartner Group.

IBM is the only vendor in the market with such a wide client offering. We know one size does not fit all, so we provide different sizes for different customer needs.

We have strategic partnerships with both Microsoft and Citrix. This ensures full compliance with these important software vendors and also helps us in creating the right thin client offerings.

IBM is not only a thin client box mover. IBM can supply everything necessary to get a thin client environment up-and-running smoothly, and then support it.

Backup foils

- Thin client technology is still new - test before you promise
- ICA and RDP are 256 colors only
- No audio in (capture) support in ICA or RDP - only audio out (playback)
- N2200 hardware uses only USB ports, external devices require converters
- The TCM Netscape 4.5 browser only generates PostScript print output
- Limited font support in the TCM Netscape 4.5 browser - web pages may not look exactly like Windows users are used to

If you are unsure - run a pilot to verify!

Even though thin client technology has been on the market for a couple of years, it is still a new technology and there are still limitations one should be aware of.

N2200 has USB only - but currently does not support any USB devices other than USB->Serial and USB->Parallel converters. You can not use a USB scanner, USB printer or USB modem and expect them to work. You can use serial devices via a Belkin F5U103 USB->Serial converter or parallel devices via a Belkin F5U002 USB->Parallel converter.

As the Netscape 4.5 browser in TCM is based on the Unix Netscape code, it is only capable of generating PostScript output (when printing). This means you need PostScript-capable printers. One solution is to install GhostScript on an NT or Unix server and let it convert from PostScript to other printer data streams (e.g. PCL). This works fine, but requires installing GhostScript.

Also an inheritance from the Unix Netscape code is the limited font support. Web pages are too often written to display best with fonts only available on the Windows platform (web page developers often tend to forget cross-platform support). This means that some fonts will display with a similar, but not identical, fonts and the web pages may not look exactly as they do on the Windows platform.

- Advanced multimedia requirements
 - ✓ Creation of multimedia presentations
 - ✓ More than 256 colors requirements
 - ✓ Video
 - ✓ Audio in
- Advanced external devices
 - ✓ Floppy disks
 - ✓ CD ROM
 - ✓ Scanners
- Windows applications that do not run well in an NT/TSE environment
 - ✓ Can use a mix of thin clients and PCs to get the best of both worlds

If you are unsure - run a pilot to verify!

Thin clients are not meant to take over 100% of the PC market. The PC is a great invention and few (no?) companies will manage without them.

When working with thin clients, its important to know the limitations of thin client technology, so you know where to roll-out thin clients - and where not to.

Thin clients are not suitable for demanding applications, such as creation of multimedia content. These graphics artists need high color depths, high-performance video and audio capture capabilities. Thin clients are not suitable for that today.

Also, floppy disks and CD ROMs can not be connected to thin clients (and should not). When these devices are required, use a PC. Scanners (serial) could be connected to thin clients, but then again, we are probably into multimedia content creation.

Most Windows applications do run very well in an NT/TSE environment. However some applications - notably DOS applications, but also some Win32 applications - do not perform very well in NT/TSE. For these applications, a PC is still the best choice.

- > USB->Parallel
 - ✓ Belkin F5U002

- > USB->Serial
 - ✓ Belkin F5U103 (F5U003)

- > USB hubs
 - ✓ Belkin F5U001
 - ✓ JCCOM UT USB41
 - ✓ CATC U-HUB-AN14

See <http://www.ibm.com/nc> for the most up-to-date list!