



Thin clients

Not everyone needs the facilities fat client systems have to offer. Dave Mitchell puts a dozen thin client terminals to the test

With so many support departments understaffed and overworked, you have to wonder why some companies insist on placing a PC on every desk when their staff clearly don't need all the facilities these 'fat' client systems offer. The LAN has allowed a significant portion of power to move out of the administrator's hands and into those of the users. PC-based storage holding locally installed applications and data brings a plethora of problems, not least management, security and support. In environments where users genuinely don't require these facilities, the thin client network looks far more sensible, and in this month's group test we take a look at a dozen hardware client solutions.

When you see the advantages offered by the thin client network, it's amazing it isn't more popular. All applications and data are held centrally on a server and accessed remotely by compact, basic devices on the desktop. With no hard disk, floppy or CD-ROM drives, the thin client offers no local storage facilities and, in most cases, comes with nothing more than a reasonably fast processor, a modest supply of SDRAM and enough internal Flash memory to run an embedded operating system.

The Desktop displayed when a user logs onto a server providing Terminal Services looks no different to a normal Windows environment, but the applications they run and the data they create never leave the server. The only network communications occurring are inward-bound keyboard presses and mouse movements from the client and outward-bound screen refreshes sent back by the server.

So what are the key advantages of this technology? In many ways, the thin client takes the network back to a structure similar to that of the mainframe environment. This is no bad thing, as the mainframe offers one major advantage that makes management infinitely easier – centralisation. All major hardware is installed and maintained in a single location and

software is accessed from dumb terminals. As a result, all support departments can also reside in the same location as the mainframe, therefore providing fast response times in the event of failures.

With all data in a central repository, security can be tightened, as you can determine precisely what data and applications a user can access. Backup also becomes much simpler, since you don't have to worry about data stored on the desktop. Any application upgrades can be carried out easily too – you only need to apply them once to the software on the server rather than deploying them across the network to each PC. Plus, with most avenues of access cut off, viruses can't be introduced to the system by users.

All applications and data are held centrally on a server and accessed remotely by compact, basic devices on the desktop

The thin client also offers much lower initial costs and reduced TCO (total cost of ownership). True, it's possible to buy basic, low-end PCs for a few hundred pounds each, but most businesses are likely to spend far more than that, as they'll need to upgrade them frequently to keep in step with the latest bloatware. Similarly, ongoing support costs for thin clients are less – they contain no moving parts and so are less likely to fail and will probably last longer than a PC. Also, lower power consumption means smaller utility charges, while an absence of cooling fans and chattering hard disks cuts background noise levels considerably. Even equipment theft comes into the equation – thin clients are less likely to be stolen, as their inability to run local applications severely limits their value.



Central to delivering Windows applications over a thin client network is the server. Windows 2000

Server comes with the Terminal Services component as standard, whereas Windows NT 4

Server was offered as a separate Terminal Server Edition. What you run on top of this depends on the services you want to deliver. If only basic services are required, you can settle on Microsoft's RDP (remote desktop protocol), but if you need advanced features you should consider the Citrix MetaFrame Windows NT/2000 Server add-on. This uses Citrix's own ICA (independent computing architecture) protocol and delivers a range of enhancements, including application and server load balancing, the ability to publish applications over the Web and a powerful client that requires minimal network bandwidth, as well as features such as COM port redirection. Naturally, Citrix ICA is more popular than Microsoft's RDP, but the latter has made significant improvements, with the next version expected to support TrueColor at the client and require less bandwidth than ICA.

When we invited vendors to the group test, we asked for products that primarily supported a Windows 2000 Terminal Services environment, with a key focus on value. Only two companies declined our invitation – IBM said it no longer offered a thin client product line and Dell advised us that it wouldn't be participating, but didn't give a reason. It took a further three weeks for the company to state that it 'didn't have a suitable offering available to submit on this occasion', although a browse through Dell's Web site at the time of writing failed to unearth any thin client products at all.

If you're considering a move into thin client technology, the wide range of products on review in this group test will help you make an informed buying decision.



● SPECIFICATIONS AND FEATURES



	ANT TC-1000NX	Fujitsu Siemens SCOVERY 110	HP Evo T20	NCD ThinSTAR 500	Neoware Capio 616	Optoma ST320	Optoma ST1510	TeleVideo TeleCLIENT TC7380L	VXL Instruments Netica Pro TC4000-75
Overall rating	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Price (exc VAT)	£299	£438	£450	£384	£325	£275	£750	£666	£326
Supplier	ANT 01782 544700	Fujitsu Siemens 01344 475555	Hewlett-Packard 0845 270 4000	NCD 0845 458 3710	Neoware 01344 382164	Optoma Europe 01923 691800	Optoma Europe 01923 691800	TeleVideo Europe 00 31 345 549691	VXL Instruments 01614 297767
Manufacturer's Web site	www.acutetech.co.uk	www.fujitsu-siemens.com	www.hp.co.uk	www.ncd-europe.com	www.neoware.com	www.optoma.co.uk	www.optoma.co.uk	www.televideo.com	www.vxl.net
Basic warranty	1yr RTB	3yrs on-site	3yrs on-site	3yrs RTB	3yrs RTB	3yrs RTB	3yrs RTB	2yrs RTB	2yrs RTB
CHASSIS									
Dimensions with stand W x D x H (mm)	123 x 201 x 231	99 x 200 x 255	90 x 174 x 226	115 x 281 x 240	36 x 208 x 241	67 x 168 x 186	395 x 235 x 408	384 x 183 x 400	86 x 215 x 256
Power supply	External	External	External	External	Internal	External	External	External	External
Kensington Lock support	✗	✗	✗	✓	✗	✗	✓	✗	✓
Monitor included	✗	✗	✗	✗	✗	✗	Integral 15.1in TFT	Integral 15.1in TFT	✗
Keyboard	✓	✗	✓ (USB)	✓	✓	✗	✓	✓	✗
Mouse	✓	✓	✓ (USB)	✓	✓	✓	✓	✓	✓
SOFTWARE									
Installed OS	Windows CE 3	Windows CE 2.12	Windows NT 4 Embedded	Windows CE 2.12	Windows CE 3	Windows CE 3	Windows CE 3	Windows CE 2.12	Gio Linux
Web browser	Internet Explorer 4	Internet Explorer 4 (optional)	Internet Explorer 5.5 (optional)	Internet Explorer 4	Internet Explorer 4	Internet Explorer 4	Internet Explorer 4	Internet Explorer 4 (optional)	Netscape Navigator
Included management software	✗	✗	✗	✗	✗	✗	✗	✗	✗
Optional management software	Enterprise Remote Management	WyseWorks Remote Administrator 3000	Rapport Administrator	ThinPATH Manager	ezRemote Manager	OptoView	OptoView	TeleMANAGER	inControl Enterprise
CONTROLLER BOARD									
Manufacturer	ANT	Wyse	Wyse	NCD	Neoware	Optoma	Optoma	TeleVideo	VXL
Processor type	National Geode GX1	National Geode GXLV	Cyrix Media GXm	National Geode GX1	National Geode GX1	National Geode GX1	National Geode GXm	National Geode GX1	National Geode GX1
Processor speed (MHz)	300	233	300	300	300	200	233	300	200
MEMORY									
Type	Embedded SDRAM	Embedded SDRAM	SODIMM	Embedded SDRAM	SODIMM	Embedded SDRAM	Embedded SDRAM	Embedded SDRAM	SODIMM
RAM fitted	32Mb	32Mb	64Mb	32Mb	32Mb	32Mb	32Mb	64Mb	32Mb
Maximum RAM	256Mb	64Mb	128Mb	288Mb	128Mb	128Mb	128Mb	192Mb	128Mb
Free/total sockets	0/0	1/1	0/1	1/1	0/1	0/0	0/0	1/1	0/1
User upgradable	✗	✓	✓	✓	✓	✗	✗	✗	✓
Flash memory	16Mb	16Mb	48Mb	16Mb	16Mb	8Mb	16Mb	16Mb	16Mb
PROTOCOL SUPPORT									
Microsoft RDP	✓	✓	✓	✓	✓	✓	✓	✓	✓
Citrix ICA	✓	✓	✓	✓	✓	✓	✓	✓	✓
PPP	✓	✓	✓	✓	✓	✓	✓	✓	✓
DHCP	✓	✓	✓	✓	✓	✓	✓	✓	✓
DNS	✓	✓	✓	✓	✓	✓	✓	✓	✓
SNMP	✓	✓	✓	✓	✓	✓	✓	✓	✓
TERMINAL EMULATION									
VT100, 220, 320	Optional	✓/✓/✓	Optional	✓/✓/✓	✓/✓/✓	Optional	Optional	Optional	✓/✓/✓
IBM3151, 3270, 5250	Optional	✗/✓/✓	Optional	✓/✓/✓	✓/✓/✓	Optional	Optional	Optional	✓/✓/✓
WY50, 60, 120	Optional	✓/✓/✗	Optional	✓/✓/✓	✓/✓/✓	Optional	Optional	Optional	✗/✓/✓
ADDS	Optional	✗	Optional	✓	✓	Optional	Optional	Optional	✓
Others	✗	SCO Console	✗	✗	SCO, Siemens Tandem, Hazeltine	✗	✗	✗	Tarantella
INTERFACES									
PS/2 mouse	✓	✓	✗	✓	5	✓	✓	✓	✓
PS/2 keyboard	✓	✓	✗	✓	5	✓	✓	✓	✓
Serial	2	2	✗	2	1	1	1	1	2
Parallel	1	1	✗	1	1	1	1	1	1
USB	2	1	4	2	2	2	2	2	2
Video	✓	✓	✓	✓	✓	✓	✓	✓	✓
Network	10/100BaseTX	10/100BaseTX	10/100BaseTX	10/100BaseTX	10/100BaseTX	10/100BaseTX	10/100BaseTX	10/100BaseTX	10/100BaseTX
Audio line-in	✓	✓	✓	✓	✓	✗	✓	✓	✓
Audio line-out	✓	✓	✓	✓	2	✗	✓	✓	✓
Smart Card slot	✓	✗	✗	✗	Optional	✗	✗	✗	Optional
PC Card slot	✗	Type II	✗	✗	✗	✗	✗	✗	Optional
Other features	✗	✗	SmartMedia slot	PCI slot	✗	✗	✗	Integrated wireless	✗
VIDEO									
Maximum resolution/ refresh supported (Hz)	1,024 x 768 x 75	1,280 x 1,024 x 60	1,280 x 1,024 x 60	1,280 x 1,024 x 85	1,280 x 1,024 x 75	1,280 x 1,024 x 75	1,024 x 768 x 60	1,024 x 768 x 60	1,280 x 1,024 x 70
Colour depth at maximum resolution	64,000	256	256	256	256	256	64,000	64,000	64,000



How we test

We decided against performance testing the thin clients. Realistically, local performance won't be an issue, as the speed at which an application runs will be determined almost exclusively by the power of the server running the Terminal Services. The only data passing between the client and server will be screen refreshes and keyboard and mouse presses. Network bandwidth may come into the equation, but a switched Fast Ethernet network is unlikely to be stressed until client numbers are in the hundreds.

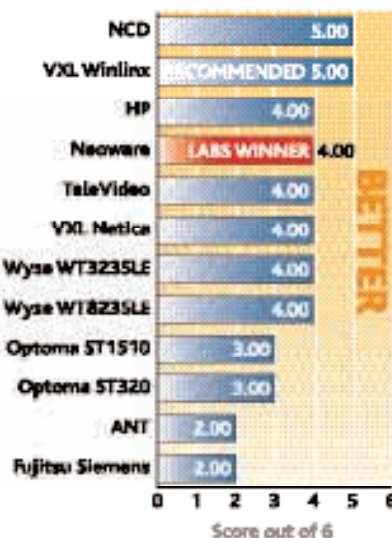
Instead, we decided to look closely at those features that make a thin client special. A terminal is designed to reduce the burden of management considerably, so we viewed ease of installation as a key factor. Considering how simple most of these devices are, we felt it was fair to expect the system to be up and running in a matter of minutes. Fortunately, with nearly all the review products running Windows CE, this didn't prove to be a problem, as this OS runs a simple Wizard-based installation after the first power-on.

Once the clients are up and running, they need to be monitored, controlled and updated easily, so good-quality network-management software is a must. As this software is the only way you can keep track of installed clients and usually can't be used with other vendors' hardware, it was surprising to find most companies only offered it as an optional extra. Build quality is important too, because thin clients have to suffer the same type of office environment as the average workstation, but their size makes them more prone to accidental damage.

To test each system, we used a Pentium III/733-equipped server with 256Mb of RAM and running Windows 2000 Server. DHCP (dynamic host configuration protocol) services were configured for the thin clients, and Windows Terminal Services was installed in Application Mode, which automatically creates an RDP 5 (Remote Desktop Protocol) connection ready for use. We used the monitored installation feature of Terminal Services to load applications such as Word 2000 and Excel 2000 on the server ready for client access. Internet access features were tested using a separate proxy server installed on the test network, and clients that came with a browser were configured to access this system.

When it came to selecting the best, we took into account the diversity of the thin client market and gave the Labs Winner award to the product whose features allowed it to fit into most Windows-based scenarios. The Recommended award went to the product we felt offered the best combination of management and value.

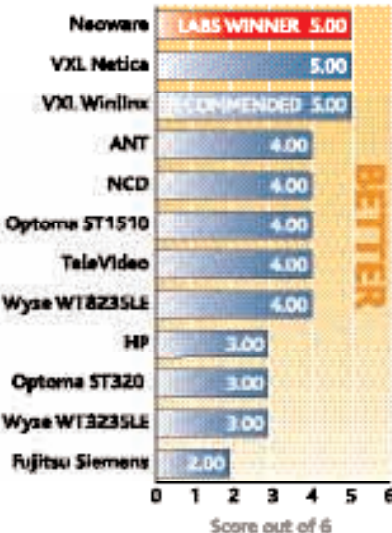
MANAGEMENT



FEATURES



OVERALL



VXL Instruments Winlinx Pro TC4000-50	Wyse Winterm WT3235LE	Wyse Winterm WT8235LE
★★★★★	★★★★★	★★★★★
£326	£349	£399
VXL Instruments 01614 297767	Wyse Technology 0118 982 8335	Wyse Technology 0118 982 8335
www.vxl.net	www.wyse.co.uk	www.wyse.co.uk
2yrs RTB	3yrs RTB	3yrs RTB
86 x 215 x 256	194 x 157 x 43	194 x 157 x 43
External	External	External
✓	✗	✗
✗	✗	✗
✗	✓ (USB)	✓ (USB)
✓	✓ (PS/2)	✓ (PS/2)
Windows CE 3	Windows CE 2.12	Windows NT 4 Embedded
Internet Explorer 4	Internet Explorer 4	Internet Explorer 5
inControl for Terminals	✗	✗
inControl Enterprise	Wyse Rapport Workgroup	Wyse Rapport Workgroup
VXL	Wyse	Wyse
National Geode GX1	National Geode GX1	National Geode GX1
200	300	300
SODIMM	Embedded SDRAM	Embedded/SODIMM
32Mb	32Mb	96Mb
128Mb	128Mb	192Mb
0/1	1/1	0/1
✓	✓	✓
32Mb	16Mb	64Mb
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓/✓/✓	✓/✓/✓	Optional
✓/✓/✓	✓/✓/✓	Optional
✗/✓/✓	✓/✓/✗	Optional
✓	✓	Optional
Tarantella	SCO Console, VT420	✗
✓	✗	✗
✓	✗	✗
2	✗	✗
1	✗	✗
2	4	3
✓	✓	✓
10/100BaseTX	10/100BaseTX	10/100BaseTX
✓	✓	✓
✓	✓	✓
Optional	✗	✗
Optional	✗	✗
✗	SmartMedia slot	SmartMedia slot
1,280 x 1,024 x 70	1,280 x 1,024 x 60	1,280 x 1,024 x 60
64,000	256	256



ANT TC-1000NX

PRICE £299 (exc VAT)

SUPPLIER ANT 01782 544700

INTERNET www.acutetech.co.uk

BASIC WARRANTY One year RTB

VERDICT Management tools are basic, but don't be fooled by the low price, as this thin client offers a relatively good hardware specification.

A cute Network Technologies (ANT) claims that the TC-1000NX is the most cost-effective thin client on the market, and a price tag on the right side of £300 leaves little room for argument.

Even more impressive is that ANT hasn't made any sacrifices to achieve this price point, as the TC-1000NX comes equipped with a speedy 300MHz National Geode GX1 processor teamed up with 32Mb of SDRAM and 16Mb of Flash memory. It also comes installed with the latest Windows CE 3.

The TC-1000NX is well built and its sleekly curved chassis will undoubtedly look good on your desktop. There has been no skimping on

interfaces either, as it comes with two serial, two PS/2, a parallel and two USB ports, plus video and audio ports. The removable rear section acts as a cable tidy.

The system memory can be upgraded to a maximum of 256Mb, but with the controller board buried deep inside the chassis this is only a factory option. The power button is sensibly recessed in the top panel and also has a built-in delay to avoid accidents.

The supplied documentation is minimal and is limited to a basic quick-start pamphlet, which outlines the Wizard-assisted installation. The TC-1000NX comes



with the pocket version of Internet Explorer 4 installed, so users can browse the Internet directly from their thin client.

From the Web folder in the Terminal Settings page, you can set home and search pages and allow users to store favourite sites. We tested this feature via our proxy server and found that Web access could be easily achieved via the TC-1000NX without using the Terminal Services, so it's worth considering thin clients with built-in browsers if you want users to have these facilities.

Both RDP and ICA clients are supplied as standard, but if you need support for connections to legacy or Unix systems note that ANT is one of many vendors that only supplies a terminal emulation software package as an optional extra. ANT's optional Enterprise Remote Management software provides a reasonable range of tools for administering a thin client environment. You can create a profile containing all terminal settings and user information and apply it to multiple clients, remotely reboot them and keep an eye on general statistics.

PC PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

Fujitsu Siemens SCCOVERY 110

PRICE £438 (exc VAT)

SUPPLIER Fujitsu Siemens 01344 475555

INTERNET www.fujitsu-siemens.com

BASIC WARRANTY Three years on-site

VERDICT Comparatively pricey, but this solidly built thin client comes with a built-in PC Card slot and has easy access for memory upgrades.

O f the three products in Fujitsu Siemens' SCCOVERY range, the 110 was the only model that satisfied our requirements for this group test. The xS can function as a thin client and desktop PC, while the Easygate is a Linux-based Internet appliance for SMEs.

Built around a Wyse Series 3000 controller board, the 110 comes with a Geode GXLV 233MHz processor and 32Mb of embedded SDRAM memory. Upgrades are a possibility, as the 110 is clearly designed with the user in mind – the main board is fitted on slides and can be easily removed from the rear. On-board you'll find a spare SODIMM socket, although Fujitsu Siemens only recommends upgrading to a maximum of 64Mb.

Another key feature is the integrated PC Card slot, which supports a range of wireless adaptors, while dial-up connections can be achieved using a modem or ISDN PC Card.

The 110 provides a wide choice of interfaces, with the main board supplying serial, parallel, audio and PS/2 ports. A separate daughtercard looks after the power connection and brings into play a single USB and video port. The large power button stands proud of the top casing, but pressing it will only activate a power-down sequence, which can be overridden from the screen if necessary.

Naturally, installation follows



the Wyse Winterm method, which provides a simple Wizard before moving you on to the Windows CE connection screen. The PC Card settings can be accessed from the Terminal Properties screen where you can install a modest set of embedded drivers.

We attempted to create a connection with both U.S. Robotics and Intel wireless PC Cards, but although the 110 noted them being inserted it didn't have suitable drivers installed. No Web features are included in the price either, as the embedded IE 4 is an optional extra and wasn't supplied with the review system.

Although Wyse has now moved over to its Rapport management software, Fujitsu Siemens is still offering the older WyseWorks Remote Administrator 3000 software as an option. Specifically designed to manage Wyse 3000 series thin clients, it does provide a reasonable level of administration tools such as auto-discovery and firmware downloads, but it's looking long in the tooth now and pales into insignificance when compared to Rapport.

PC PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★



HP Evo T20

PRICE £450 (exc VAT)

SUPPLIER Hewlett-Packard 0845 270 4000

INTERNET www.hp.co.uk

BASIC WARRANTY Three years on-site

VERDICT It may be a Wyse in disguise, but the T20 offers a reasonable specification for the price, plus good management facilities.

Given its size and apparent product portfolio, it's surprising HP currently offers such a modest thin client solution, and even this came courtesy of the Compaq acquisition. The Evo range consists of only two models – the T1010 provides a wider choice of terminal emulation features and PC Card support, and the T20 on review comes in four flavours offering a range of memory and embedded OS options. The latter isn't manufactured by HP, but is the result of an arrangement made in May last year with Wyse Technology, which agreed to supply Compaq with the thin client hardware and its Rapport management software.



The T20 came equipped with 64Mb of SDRAM memory and Windows NT 4 as the choice of embedded operating system. This offers a wider range of security features and better remote management facilities than Windows CE, but does require a lot more memory. The T20 is a well-built device with a single power button at the front, which incorporates a simple multicoloured status indicator. Parallel and serial ports aren't provided, but the T20 comes with four USB ports instead, and a USB mouse and keyboard are supplied as standard.

The system was clearly built with end-user upgrades in mind, as the side panel is held on with only a couple of clips and is easily removed. Inside, you'll find a tidy Wyse controller board fitted with a single SODIMM memory socket at the top and a SmartMedia reader below.

Installation won't take long – the T20 may be running Windows NT, but it doesn't offer many user options. After logging on to a 'pseudo' local domain to get started, you can create a variety of connections and store them in a Manager utility for easy access.

IE is provided for Web access, but all users are able to do locally is view the RAM drive from Explorer and shut down or restart the system. The Rapport Management utility is an MMC snap-in and requires agent services loaded on each NTe (NT Embedded) client. This can be achieved easily using Rapport's Software Manager, after which it's possible to automatically apply firmware updates and images across the network, modify a client's local properties and create and distribute connection profiles.

PC PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

NCD ThinSTAR 500

PRICE £384 (exc VAT)

SUPPLIER NCD 0845 458 3710

INTERNET www.ncd-europe.com

BASIC WARRANTY Three years RTB

VERDICT Not the best build quality, but the ThinSTAR 500 does offer an impressive range of management tools.

The ThinSTAR 500 isn't as sleek as the majority of thin clients on review, but this chunky unit does offer a unique feature – it provides a standard internal PCI expansion slot. It supports Cisco Aironet wireless PCI adaptors, or you could add a low-cost PCI card modem for dial-up access. The NCD controller board is deeper than most, but it comes with 32Mb of embedded SDRAM and the empty SODIMM socket allows this to be expanded to 288Mb without having to replace existing components.

Upgrade operations won't take long either – the lightweight plastic shell is easily unclipped from the inner casing to give

unimpeded access to the main board. Unfortunately, there's no facility for locking the shell down to keep wandering fingers at bay.



The full complement of interfaces is provided and carefully arranged around the expansion slot backplate. The ThinSTAR 500 sensibly has the pair of audio sockets located at the front for easy access. Note that the expansion slot will require a riser card to convert it to horizontal mount.

With Windows CE 2.12 in the driving seat, installation won't take long. NCD's Wizard starts off by asking you to choose between a dial-up or LAN connection and Citrix or

Microsoft clients as well as posing a few questions about the network. This is a swift process and NCD was one of few vendors that offered to set up locally attached printers during this phase.

NCD scores well in the management stakes, as it offers an extensive range of software options that delivers to RDP users many features found in ICA such as load balancing and shadowing.

The ThinSTAR Management Service (TMS) ensures all clients are running the correct software, while multiple thin clients are administered from the ThinPATH Manager utility. This allows local settings to be controlled and applied to specific groups. Decide which options are available for users to modify, then register the configuration file with the TMS and it will deploy the new settings automatically.

NCD's ThinPATH Plus also offers enhancements to Microsoft's RDP, allowing local peripherals such as printers or audio devices to be used more effectively and local USB authentication devices to be implemented.

PC PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★



Neoware Capiro 616

PRICE £325 (exc VAT)

SUPPLIER Neoware 01344 382164

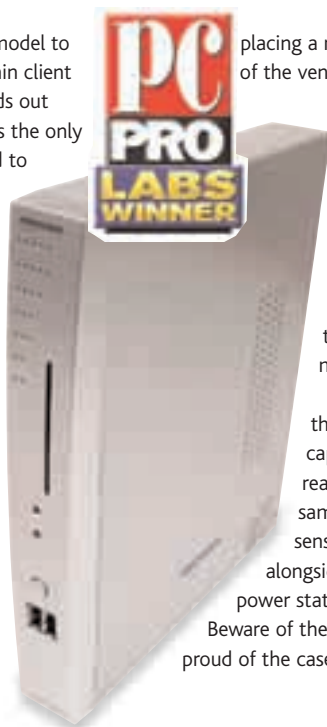
INTERNET www.neoware.com

BASIC WARRANTY Three years RTB

VERDICT Plenty of features at a tempting price along with above-average management tools and the best build quality in town.

The Capiro 616 is the latest model to join Neoware's extensive thin client family. It immediately stands out from the thin client crowd as it's the only device on review that's designed to stand vertically on the desktop or sit comfortably underneath a monitor. Not only that, but it comes with an internal power supply, reducing space requirements even further since it doesn't need a separate transformer brick trailing from its rear. However, the stingy one-metre proprietary power cable does mean the Capiro must be placed in close proximity to a power source.

As you'd expect, the steel cover is extremely solid, although one concern is that



placing a monitor on it will block some of the ventilation holes. The outer casing is easily removed and inside you'll find an internal steel chassis complete with bracing bars. Cut-outs are located above the SODIMM socket so the standard 32Mb of RAM can be easily upgraded, although you'll have to sacrifice the existing module.

A slot at the front indicates the Capiro has smart card capabilities, but the optional reader wasn't fitted on our review sample. The two USB ports are sensibly placed on the front panel alongside a couple of LEDs revealing power status and network activity.

Beware of the small power button standing proud of the case as it has no delay or

shutdown timer built in and will power the unit off immediately if touched.

Installation is a cinch and we had the Capiro up and running in a matter of minutes. One of the 616's selling points is that it offers extensive terminal emulation support, which comes courtesy of the ubiquitous Pericom TeemCE software. On the other hand, it's debatable whether most small businesses will require this feature across all their thin clients.

Neoware's optional ezRemote Manager deals with client administration and runs an auto-scan routine on loading. It populates its main window with all discovered units, showing details such as the node name, installed OS and main board versions, IP address and Flash memory size.

Software updates or snap-in modules can be deployed directly to individual systems or all members of a selected group, but there's no option to schedule upgrades for a convenient time. A shadow feature brings client monitoring and remote control into the picture, as you select a node and view its screen contents within the main ezRemote window.

PC PRO RATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

Optoma ST320

PRICE £275 (exc VAT)

SUPPLIER Optoma Europe 01923 691800

INTERNET www.optoma.co.uk

BASIC WARRANTY Three years RTB

VERDICT If you're on a tight budget and don't require local audio facilities, the low-cost ST320 is worth considering.

Optoma's diminutive ST320 is proving to be so popular that it's now appearing in other vendors' product line-ups, with ANT, for example, rebadging it as its TC-3000. It's also marginally better priced than ANT's TC-1000NX.

There are only minimal differences, as audio line-in and line-out sockets on the ST320 are optional and it only comes equipped with 8Mb of Flash memory as opposed to 16Mb. However, if you're not planning on using audio features and are expecting clients to open only a few simultaneous terminal sessions, the ST320 should be more than adequate.

The compact chassis sports a National Geode GX1 processor complemented with 32Mb of SDRAM. This can be expanded to

128Mb, but user upgrades aren't an option as no memory sockets are provided.

Apart from the lack of audio capabilities, the ST320 is fully endowed with the basic interfaces. There are serial, parallel, video and network ports at the rear, while a pair of USB ports plus PS/2 mouse and keyboard ports are located in a recess at the front.

There are no cutbacks on the software front, as the ST320 comes with Windows CE 3, while the pocket version of Internet Explorer 4 allows users to access the Web separately. The setup Wizard makes light work of installation and you'll find the full range



of options available in the Terminal Properties window. This includes password-protected users who determine levels of local access.

As with the ST1510, network management comes courtesy of the optional OptoView software, so all your Optoma devices can be kept under one roof. A discovery routine makes light work of locating all clients, and you can set this to run at regular intervals and limit it to specific address ranges.

A selected client displays its terminal properties, which can be modified remotely and saved to the client. It's also possible to view and modify the local client connection window in the same manner. A useful feature is the Mirror option, which displays the client's screen in the OptoView window and extends remote-control facilities to the administrator.

We found overall performance was impressive, and Mirror also functions when the client is connected to Terminal Services and running other applications.

PC PRO RATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★



Optoma ST1510

PRICE £750 (exc VAT)

SUPPLIER Optoma Europe 01923 691800

INTERNET www.optoma.co.uk

BASIC WARRANTY Three years RTB

VERDICT More costly than the TFT-equipped TeleVideo alternative and offered with fewer options, but build quality and management tools are superior.

Whereas the majority of vendors specialise only in thin client development, Optoma has a few more strings to its bow. Most notably, this consists of a strong product line of digital projectors and LCD monitors. It has certainly put its expertise in the latter field to good use, as the ST1510 is a complete thin client solution equipped with a tasty 15.1 TFT LCD monitor. Unlike TeleVideo's TC7380 range, which comes in browser-based, wireless and touchscreen variants, the ST1510 is only offered in 12.1in or 15.1in formats with an optional touchscreen.

Optoma scores higher in the build quality stakes



because the ST1510 looks and feels extremely solid. The monitor stand is also mounted in a circular plate in the base so that it offers the full range of movement.

Installation follows a similar path to the TC7380L, although Optoma's Windows CE Wizard has a few more network options to fill in. We also found the screen resolution was fixed at 1,024 x 768 x 60Hz and couldn't be modified. The ST1510 utilises the built-in Microsoft pocket Internet Explorer 4, so you can browse the Web without going through any Terminal Services if required. Optoma's Terminal Properties window provides some extra tabs,

allowing you to set up local users and determine access privileges.

OptoView is the optional management tool of choice. This delivers an Explorer-style interface that displays all discovered clients in a tree structure down one side and their local settings opposite. From the same window, you can create and deploy global parameters and reboot groups or individual systems. Event logs are maintained and can be exported to Excel spreadsheets or SQL Server 2000 databases.

The ST1510 comes with a standard 32Mb of embedded SDRAM and 16Mb of Flash memory, which can be upgraded to 128Mb and 144Mb respectively. However, the casing isn't designed to be removed by a user, so these are only offered as factory options. All standard interfaces are provided, but more thought has gone into their placement. Mouse, keyboard, serial, parallel, network and audio line-out are neatly tucked out of sight underneath the back of the monitor, while the two USB and audio line-in ports are located at the rear of the sturdy pedestal.

PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

TeleVideo TeleCLIENT TC7380L

PRICE £666 (exc VAT)

SUPPLIER TeleVideo Europe 00 31 345 549691

INTERNET www.televideo.com

BASIC WARRANTY Two years RTB

VERDICT Not as well built as Optoma's ST1510, but TeleVideo offers more options and the integral wireless feature adds extra value to this tidy package.

The TC7380 series is the latest to join TeleVideo's extensive TeleCLIENT product range and – as with Optoma's ST1510 – provides an all-in-one solution. Built around a 15.1in TFT monitor, the range consists of five models. Many of the optional features can be combined in one unit. So along with the base model, which provides basic RDP and ICA connectivity, it's possible to add terminal emulation tools, go for the browser-based version, add touchscreen capabilities or, in the case of the TC7380L on review, bring in wireless networking.

Design and build quality are impressive, with the unit feeling nicely weighted and stable. The TFT monitor only supports resolutions up to 1,024 x 768 and

16-bit colour, but image quality is particularly good, with a wide horizontal and vertical viewing angle. There's no OSD; four buttons on the front panel control the screen's brightness and adjust the volume levels of the built-in speakers. The small controller board is mounted internally in a shielded case behind the TFT



screen and employs a speedy 300MHz National Geode GX1 processor. This is teamed up with a healthy 64Mb of embedded SDRAM memory. A spare DIMM socket accepts up to 128Mb modules, but upgrades are a factory option only. A mini-PCI slot sits alongside the processor and is home to an 802.11b-compliant

Samsung SWL-2200M wireless card.

Connection setup follows the standard Windows CE route, although the wireless capability offers a few extra options. Multiple connections can be created and opened simultaneously, but you can't use both wireless and wired links together, as the network interface type must be selected and activated from the Terminal Properties window. For the wireless link, you can enter a specific ESS ID, select Ad-Hoc or Infrastructure modes and choose 64- or 128-bit encryption.

The optional TeleMANAGER SNMP software provides plenty of remote management tools. It automatically searches for clients, which can then be placed into groups for easier access. Selecting a client provides a complete rundown of its local settings, including areas such as software versions, addresses and even the selected monitor resolution. Firmware upgrades can be pushed to multiple clients over SNMP or HTTP, and you're able to create RDP, ICA and terminal emulation connection profiles and then apply them to different groups.

PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★



VXL Instruments Netica Pro TC4000-75

PRICE £326 (exc VAT)

SUPPLIER VXL Instruments 01614 297767

INTERNET www.vxl.net

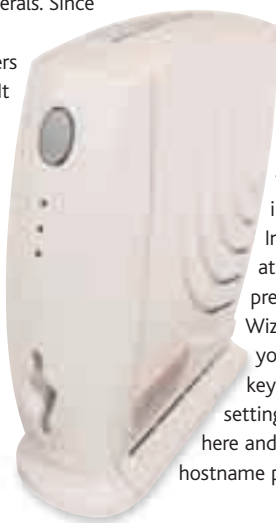
BASIC WARRANTY Two years RTB

VERDICT A highly flexible and manageable thin client that's an ideal choice where connection to a wide range of network services is required.

Based in India, VXL Instruments was formed in 1976 to manufacture, among other things, computer peripherals. Since then, the company has gone from strength to strength and now delivers an impressive range of thin clients. It claims to be the only company in Europe to offer a complete Windows NT and XP Embedded customisation service.

The Netica Pro TC4000-75 on review uses the same compact chassis as VXL's Windows CE-powered Winlinx system, so its demands on desktop real estate are minimal. Along with the optional smart card reader at the front, you'll find the full array of connectors at the rear, including a

pair of serial and USB ports, parallel and audio ports and a dual-speed network adaptor.



Aimed at the more diverse market of Unix, X-Windows and Windows Terminal Server applications, the Netica is powered by VXL's embedded Gio Linux operating system. The Pro version on review provides a tidy interface that's simple to use. Installation for the Netica starts at initial power-up, as you're presented with a neat configuration Wizard asking for details such as your preferred language and keyboard layout along with display settings. Network settings are added here and include DHCP server and hostname parameters.

Two modes of operation are supported – a Kiosk mode that emulates the Windows CE interface and presents the user with a simple menu of connection options, or a desktop mode that provides a Windows 9x-based interface for users who are more comfortable with this style. Whichever you choose, you can swap between the two, but this will require a reboot.

A System Tray is provided, which displays the current time along with a small window showing a tiny graph of local activity. The Netica supports an extensive range of network protocols and the local Setup Manager utility allows you to easily create connections over RDP, ICA or Telnet, for example, and store them ready for use. A simple Start menu is provided and each connection is added to this for easy selection.

Administrators can add details of services such as font servers and network printers and set up remote disk mounts, but more impressive is simply that it's possible to determine what local settings users can modify by creating profiles.

PC PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

VXL Instruments Winlinx Pro TC4000-50

PRICE £326 (exc VAT)

SUPPLIER VXL Instruments 01614 297767

INTERNET www.vxl.net

BASIC WARRANTY Two years RTB

VERDICT The Winlinx offers good build quality, plenty of expansion options and the low price includes basic network-management software.

The second of VXL's thin client offerings in this group test is powered by Windows CE and aimed primarily at Windows 2000 Terminal Services environments. Even so, it's still supplied with embedded clients for both RDP and Citrix ICA and, along with the Netica, offers Pericom's TeemCE, which provides Unix connectivity and supports emulations such as VT100, IBM3270 and IBM5250.

The chassis is well built and offers a chunky power button with a time-delay built in to avoid accidental shutdowns. A modest range of status indicators revealing power, network and smart card status accompanies this below.



VXL allows users to upgrade their own equipment, and getting inside the chassis for memory upgrades is fairly easy, but there's not much to see inside.

Only one SODIMM memory socket is provided on the VXL controller board, so if you want to expand you'll need to replace the existing 32Mb module. Two optional extras are available – a PC Card slot at the rear supporting a wide range of modem, wireless and Ethernet LAN PC Cards and a smart card reader at the front. The USB ports can be used to connect a local floppy disk drive, printer, mouse or keyboard.

As with the Netica, first-time installation is simple. A Wizard asks a few basic questions and you move directly to the Windows CE interface and a Connection Manager. From here, you select and initiate multiple connections to available Terminal Services. You can switch easily to local client settings, which are laid out neatly in a row of tabbed folders.

Client management is a possibility, as VXL bundles its inControl for Terminals software, which allows you to remotely manage DOS, Windows CE and NT clients. Using RASP (remote application and services protocol), it shows all connected clients in its main interface for easy selection. Only a few tools are provided – you can access and modify each client's local settings or reboot them. The most useful will be the firmware upgrade option, as it's possible to automatically download updates directly to multiple clients.

The optional inControl Enterprise looks far more useful though, because it can also manage any Netica clients and provides a wealth of tools including scheduled updates.

PC PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★



Wyse Winterm WT3235LE

PRICE £349 (exc VAT)

SUPPLIER Wyse 0118 982 8335

INTERNET www.wyse.co.uk

BASIC WARRANTY Three years RTB

VERDICT Not the best value here and the four USB ports are of limited use, but still a quality product from the thin client experts.

No thin client group test would be complete without Wyse, as the company has been a dominant force in this market for many years.

The Winterm WT3235LE is one of an extensive range of Windows-based terminals offered by Wyse and is aimed at users requiring multiple open sessions and Web access. It's

clearly a popular product, as its compact controller board is the same as that used by HP's Evo T20. However, as this is a Windows CE-powered device, it only comes with the basic 32Mb of SDRAM and 16Mb of Flash memory.

It sports the same chassis as the

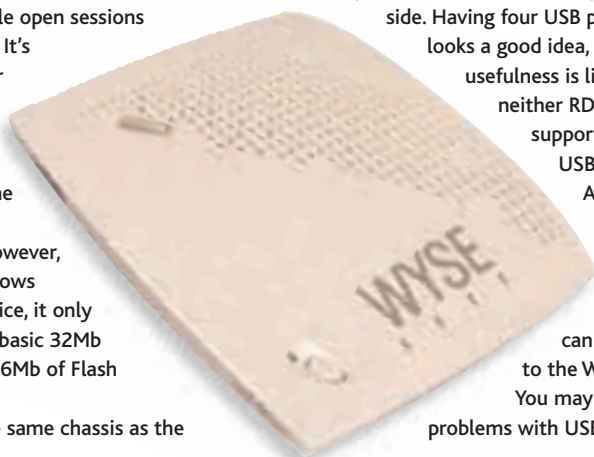
WT8235LE and is well built with a small footprint. It can be placed on the desktop, and mounting points on the baseplate allow it to be fixed to a wall or to the side of a monitor. Only one USB port is used by the standard input devices, as the supplied USB keyboard has a PS/2 mouse port on one side. Having four USB ports initially

looks a good idea, but their usefulness is limited in that

neither RDP nor ICA supports that many USB emulations.

As a result, there are a limited number of devices that can be connected to the WT3235LE.

You may have problems with USB printers,



as LPD is only able to use the parallel port and the USB ports don't show up in the Printer tab of the Terminal Properties. However, one thing that could prove useful is the optional Identix BioTouch USB200 fingerprint scanner, which brings in some tough local security. To support this feature, the client requires an extra firmware upgrade, which must be deployed using the bundled Wyse Rapport Workgroup management software.

Unlike the WT8235LE, a wide range of terminal emulations are included as standard, making this a particularly good choice for businesses that need links with a variety of legacy systems.

Internet Explorer 4 is also embedded for local intranet and Internet access. As with all products sporting IE 4, you'll find this has been cut down severely to fit it on the Flash memory alongside the OS. From the Terminal Properties window, you can set home and search pages, enable the Favourites option and supply a proxy server address, but browsing tools are kept to a minimum.

PC PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★

Wyse Winterm WT8235LE

PRICE £399 (exc VAT)

SUPPLIER Wyse 0118 982 8335

INTERNET www.wyse.co.uk

BASIC WARRANTY Three years RTB

VERDICT Better value than the similarly equipped T20, with plenty of useful features, but the management software can be difficult to install.

Along with HP's Evo T20, the Winterm WT8235LE is equipped with the Windows NT 4 Embedded operating system, which is designed to offer users who want more from their thin client a range of extra features along with superior security. You can, for example, download applications that can't be operated from a terminal server to the client and run them locally.

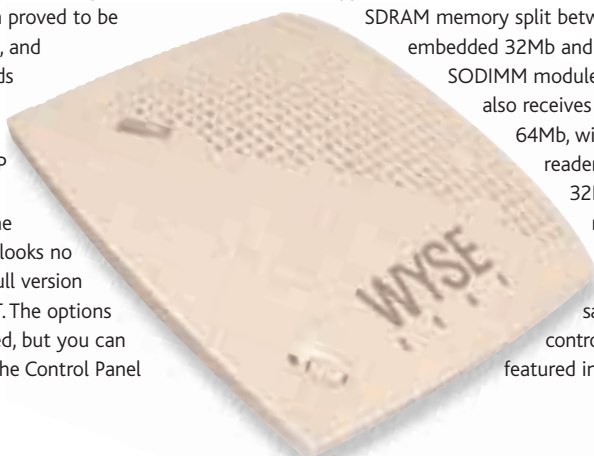
Installation proved to be straightforward, and separate Wizards are provided for creating and storing RDP and ICA connections. The main interface looks no different to a full version of Windows NT. The options are more limited, but you can still access all the Control Panel

tools and browse the Network Neighborhood. Internet access will also be a richer experience, as instead of the severely hacked down pocket version of IE 4 supplied with the Windows CE clients you get a full version of IE 5.5 pre-installed.

Naturally, the WT8235LE needs some extra horsepower to run the OS and all these applications, so it comes with 96Mb of

SDRAM memory split between an embedded 32Mb and a 64Mb SODIMM module. Flash memory also receives a boost to 64Mb, with the internal reader fitted with a 32Mb SmartMedia memory card.

Internally, you'll find the same Wyse controller board as featured in the WT3235LE



and HP's Evo T20. You get the same interface count of video, audio and four USB ports, plus Wyse bundles an Edgeport utility for assigning COM port values to USB ports.

Changes are afoot on the management front, as Wyse recently replaced the bundled Remote Administrator with its Rapport Workgroup, which is designed to handle up to 200 clients.

It was the most difficult product to install in this group test due to the sheer number of prerequisites. However, if you can persevere with the tortuous setup, you'll find that this MMC snap-in offers some of the best management tools around.

After running an auto-discovery routine, you're able to place clients into different groups, force shutdown and power-up cycles as well as use the Shadow option to remotely control and monitor selected systems. Rapport provides plenty of information about each system's configuration, and NTe clients benefit from a software-distribution tool that can run scheduled downloads of images and software packages.

PC PRORATINGS	
MANAGEMENT	★★★★★
FEATURES	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL	★★★★★