Following protocol

Bob Walder unravels the complexities of TCP/IP to help you create your own network or get connected to the internet. He covers the basics, routing, and configuring Windows 95.

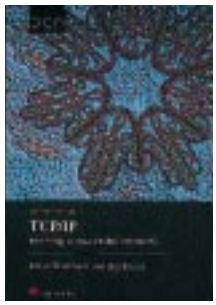
TCP/IP is the protocol which underlies the entire internet and is likely to become the standard protocol in all corporate networks (whether or not they could be classed as intranets) as well as our SME (Small to Medium Enterprise) networks.

TCP/IP has the reputation of being something of a "black art", particularly in relation to subnetting, and although it is daunting at first sight, with a little perseverance you will soon be at ease with all things IP-related.

There is a lot of material to get through here, but I have resisted the urge to cover this topic in two episodes. There is nothing more annoying than having to wait for the second half of something before you can begin a project: rather like opening your brand-new toy on Christmas morning to find that the batteries are not included!

There is plenty of background information which I would like to include here but space simply does not permit. Instead, I will concentrate on the stuff you really need to know in order to create your own TCP/IP network or connect your PC to the internet. If you want to know a bit more about the whys and wherefores behind what I am about to tell you, the best thing would be to purchase one of the many books on the subject, one of which I have reviewed here.

Bob's book review



Title TCP/IP (Running a Successful Network)
Authors K Washburn and JT Evans
Publisher Addison-Wesley
Price £29.95

In keeping with the subject matter of this month's column, I have taken a quick look at a book which should help to provide a much deeper understanding of TCP/IP and all its inner mysteries than I could ever hope to do in a few pages, here. The book is divided into three parts. Part 1 is about "what and how", and provides a useful grounding in TCP/IP without going into masses of technical detail about the guts and innards. It covers TCP/IP basics, bridging and routing, managing addresses, subnetting, system configuration and performance optimisation.

Part 2 is for the "bits and bytes" brigade, delving into the murky depths of the protocol to describe the detailed technical standards behind TCP/IP systems. It allows the technically biased reader to determine the underlying limits of TCP/IP systems and take action to ensure that systems, particularly large ones, remain stable. It is concerned with tuning performance, achieving reliability, stability and cost-effectiveness through a detailed understanding of the foundations laid in Part 1.

Part 3 is a collection of reference material and tables extracted from TCP/IP and LAN standards which can simplify the configuration and management of TCP/IP systems. Parts 1 and 2 can be read in isolation, or in either order according to interest and immediate need. Part 1 can also stand alone as a planning and implementation guide, while Part 3 can be used as general reference material.

The writing style is a little dry, perhaps, but Washburn and Evans' *TCP/IP* offers something for everyone. It is an ideal introduction to the protocol and its use in today's networks, in addition to offering a more detailed reference tome for those who require it.

■ *My thanks to Computer Manuals (0121 706 6000) for keeping me supplied with review copies.*

The basics

Starting at the beginning, then, every PC which is attached to a TCP/IP network requires a unique four-byte number which is usually written as four decimal numbers separated by dots. Thus, the smallest IP address is 0.0.0.0 while the largest is 255.255.255.255 and it can be allocated in one of two ways. The simplest and most common method for single-user internet access is to have your ISP allocate it dynamically each time you attach to the network. In this scenario, your machine does not have a permanent IP address associated with it but one is allocated temporarily each time you connect to the network.

If, however, you want to do something a little more ambitious — say, attach a small network of a dozen PCs to the internet — then you will require a range of permanent IP addresses: one for each PC and one for the router or gateway which routes your network traffic to the internet. It is this scenario on which I want to concentrate, given that this is a Networking (implying multiple nodes) rather than a Windows 95 Hands On column.

The not-so-basics

Each IP address is actually made up of two parts: a network portion and a host portion. A network in this context can be anything from an entire corporate LAN down to a single piece of wire with just one or two PCs on it. The host portion identifies each of the nodes on the network individually. But when

p321 ➢

Example 1: Logical AND operation

```
IP address              11000010.11000000.00101100.00010001     (194.192.44.17)
AND subnet mask 11111111.11111111.11111111.11110000     (255.255.255.240)
= network address       11000010.11000000.00101100.00010000     (194.192.44.16)
```

you see an address like 194.192.44.17, how do you know which is the network portion and which is the host?

The trick is to examine the subnet mask, which will look something like

```
255.255.255.0
```

If you convert these figures to binary, the subnet mask indicates which part of the IP address is the network portion.

The example I have just used is fairly straightforward, since it translates into

```
11111111.11111111.11111111.00000000
```

which indicates that the first three bytes are used to identify the network and the remaining byte is used to identify the nodes.

A quirk of the rules means we cannot use all noughts or all ones in the host or subnet address (the first indicates "the entire network" and the second is the "broadcast" address), which leaves us the numbers 1 to 254 to represent our hosts. This is known as a Class C address, where the first three bytes are fixed.

It takes a small leap of the imagination to conclude that a Class B address has the first two bytes fixed to represent the network and can have up to 65,534 hosts, while the incredibly rare Class A address has only the first byte fixed (hence there can only be 254 Class A networks in total) with the final three bytes providing us with 16,777,214 hosts.

Even a Class C network is beyond the requirements (and the means) of most of us, so ISPs will divide each Class C network allocated to it into a number of smaller subnets by further use of the subnet mask.

For instance, if you have a network of between seven and 14 PCs, a subnet mask of 255.255.255.240 will be allocated to you. To understand how this works, we need to convert our IP address and subnet mask into binary and, reaching back into our distant past and the terrors of binary arithmetic at school, we need to perform a logical AND operation on the two to provide us with our network address (Example 1).

For those of you requiring a quick refresher course, a logical AND means that wherever there is a 1 in both the IP address AND the subnet mask, then there will be a 1 in the corresponding position in the network address, otherwise it will be a zero.

Converting the resulting network address back to decimal gives us 194.192.44.16 which effectively means a Class C address of 194.192.44.0 and a subnet address of 16. Allowing for the rule that we cannot use all noughts or all ones in our network addresses, the above subnet mask thus provides us with 14 possible networks each with 14 nodes (*see box, p324*). Our example node which has a final byte of 17, therefore, is actually node 1 in network number 1 using the above mask.

Let's look at one more example: 194.192.44.55 (Example 2). Concentrating on that final byte of the IP address again, we can see that the left half (which corresponds to the four ones in the subnet mask) is 0011, which gives us a subnet number of 3, indicating the third subnet in the range available using the mask of 240 (*again, see box, p324*). The right half is 0111, which means it is the seventh node in that particular subnet. Given that the

Example 2: 194.192.44.55

```
IP address              11000010.11000000.00101100.00110111     (194.192.44.55)
AND subnet mask 11111111.11111111.11111111.11110000     (255.255.255.240)
= network address       11000010.11000000.00101100.00110000     (194.192.44.48)
```

p323 ➢

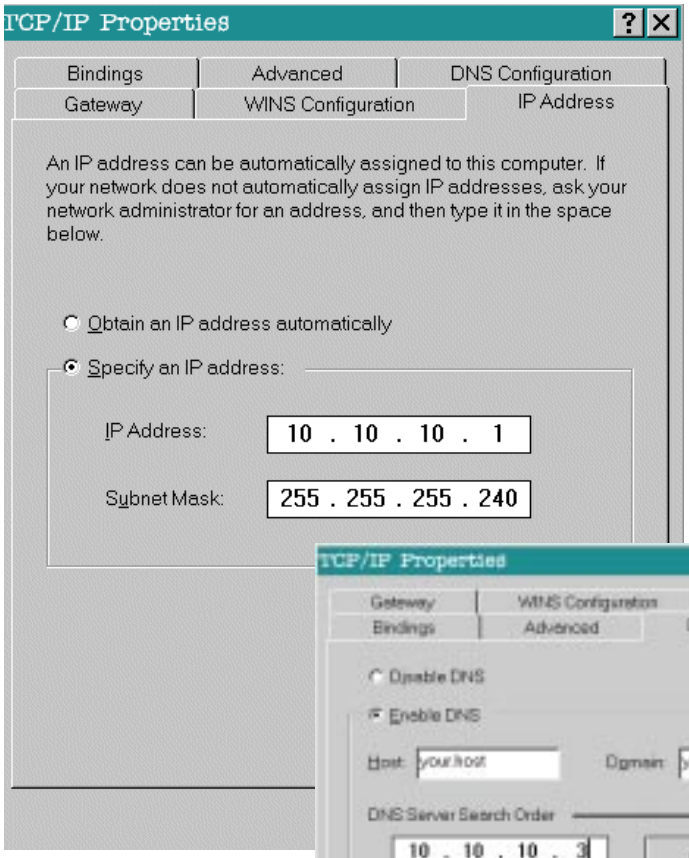


Fig 1 (left) Specifying your IP address and subnet mask in Windows 95 Control Panel

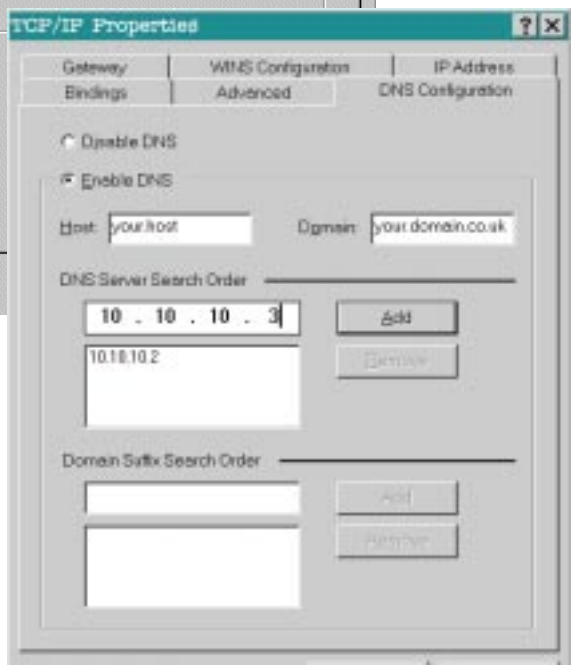


Fig 2 (below) Configuring DNS parameters

network address ends in a 48, it falls into place that the seventh node of that particular network will be 55 (48 + 7), which is our IP address.

Routing

Phew! It may take some time to get your head around the above, but it is worth re-reading a few times and working through a few examples of your own in order to get it down pat. But why is it so important to figure out which is the network and which is the host portion? Routing is the answer.

Routing is the means by which packets travel around the internet from one machine to another, and it is a router that we use to attach our network to the internet (this becomes the "default gateway"). The router will have at least two interfaces: the LAN interface (a network card) to attach it to the local network, and a WAN interface (a serial port or ISDN connection) to connect it to the internet. Each of these must be on a different subnet in order for the router to function correctly: the LAN interface will be on the same subnet as all your other networked PCs, while the communications interface will be on a subnet which has been allocated by your ISP.

When any IP device gets ready to send out a packet of information, it looks at the destination address. Using the subnet mask, it then determines whether or not the destination node is on the same network as itself. If it is on the same network, the machine simply uses the appropriate link-level protocol to send the packet directly to the destination machine. If it is on a different network, however, the packet is sent to the default gateway.

Since the router holds an internal table of what networks are connected to which LAN or WAN interface, all it has to do in order to speed things in the right direction is to logical-AND the destination host address or each packet with the subnet mask (giving the destination network address) and then look up the result in the routing table before passing the packet out of the right interface. Once the packet has been transferred from

p324 ➢

Establishing BaseCamp

Microsoft is testing a new product designed to expand the networking services of Windows NT. The product, codenamed BaseCamp, is a client-server platform designed to allow secure network connections through un-trusted networks such as the internet.

BaseCamp uses a client Connection Manager and a server-based Internet Authentication Server. This combination allows companies to build virtual private networks (VPNs) where all data is transmitted in an encrypted form over the internet. The software, in limited beta-testing at the time of writing and hopefully available by the end of 1997, will support the Point-to-Point Tunnelling Protocol (PPTP) as well as RADIUS, and CHAP authentication mechanisms.

Possible subnets using a mask of 240

In the examples in the main body of the column I used a subnet mask of 255.255.255.240 and explained how it provided 14 networks of 14 nodes. To help you work through a few examples of your own, the appropriate address ranges are:

Network 1	17 – 30
Network 2	33 – 46
Network 3	49 – 62
Network 4	65 – 78
Network 5	81 – 94
Network 6	97 – 110
Network 7	113 – 126
Network 8	129 – 142
Network 9	145 – 158
Network 10	161 – 174
Network 11	177 – 190
Network 12	193 – 206
Network 13	209 – 222
Network 14	225 – 238

the local interface to the WAN interface, it travels to the router at your ISP and onwards across the internet.

It is important that you do not try to make up your own set of IP addresses and hope to attach your network to the internet; it won't work. Addresses are allocated in large chunks to ISPs by a central authority and the ISPs dish them out in smaller chunks, as required. This is the only way to ensure that all addresses on the internet are unique.

If, however, you want to use IP in-house and have no interest in connecting to the internet, there are several "safe" ranges of non-routable addresses with which you can work. These are:

- Class A network

```
10.0.0.0 to 10.255.255.255
```

- 16 Class B networks

```
172.16.0.0 to 172.31.255.255
```

- Class B network

```
192.168.0.0 to 192.168.255.255
```

Configuring Windows 95

Although the general principle described above applies to all routers, configuring them to perform even the most basic routing functions can be quite daunting.

User interfaces and documentation often leave a lot to be desired, so a detailed description of router configuration is beyond the scope of this article. But configuring Windows 95 could not be simpler. Once you have your router installed and your network addresses allocated by your ISP, you should go to each client in turn and install the TCP/IP protocol (if that has not already been done).

In the Control Panel, click on Network, Add, Protocol, Microsoft, TCP/IP and you will eventually be presented with the configuration window which looks something like Fig 1.

There is actually not that much to configure, so you can start by entering the IP address of this machine and the subnet mask, both of which you will get from your ISP. The other information which your ISP should supply is the name of your domain and DNS server, and these should be entered in the DNS tab, as shown in Fig 2. The host name can be anything and most ISPs will not specify these for you.

Finally, in the Gateway tab, enter the IP address of the LAN interface of your default gateway, or router. When applying these changes ignore any warning messages you may get about WINS servers, and reboot your machine for the changes to take effect.

Once this operation has been performed on all clients (ensuring that a unique IP address is used on each one) your TCP/IP network should be up and running.

■ *In a future column, I will take you through setting up a DHCP or WINS server to simplify the management of IP addresses on your network.*

PCW Contact

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Share issues

Bob Walder explains how to share drives and files on a Windows 95 network and makes no secret of telling you how to set security passwords. And watch out! There's a virus hoax about.

Yet another month goes by, and by the time you read this you will be gearing up to the Christmas frenzy and trying to figure out how to stop that draught coming from under the living-room door. Ironically, as I write this, we are in the middle of the most fantastic heat wave, which in the past would have made it a real pleasure to sit in a steaming-hot lab with half a dozen heavily loaded file servers… not! But I have finally succumbed and installed air conditioning. What bliss! The strange thing, though, is the attention now lavished on the aircon unit by visitors.

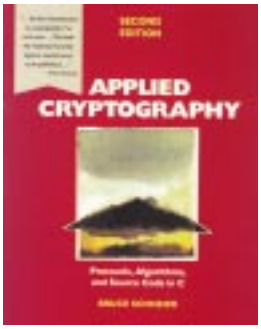
I have a really neat Olivetti Systema server which runs all my NT-based stuff and acts as the complete opposite of an air conditioner; pumping out copious amounts of hot air from its twin redundant power supplies at the back. But this impressive piece of kit is completely ignored, because it looks like a boring PC.

The air-conditioning unit is large and free-standing, with a sexy grille at the front and a neat LCD control panel with lots of buttons and flashing lights on the top. It looks nothing like a PC, with the result that recent visitors to my lab are impressed by my acquisition of what is obviously a smart new minicomputer!

Anyway, on to this month's topic which follows on from a previous column where I wrote about configuring Windows 95 networking from scratch. This time, I am going to take things one step further and briefly describe how to share drives and implement a modicum of security under Windows 95.

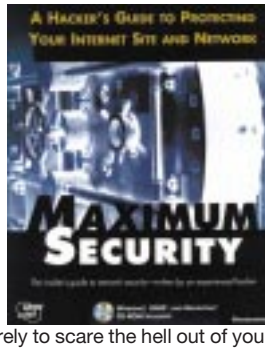
p313 ➢

Book reviews — Sshhh… you know what



■ *Applied Cryptography*
Author Bruce Schneier
Publisher Wiley
Price £39.95
Wow! Heavy-sounding title, eh? While admittedly only of interest to those who want to delve into encryption, the audience for books of this type is growing, given the paranoia over internet security in all its forms. As such, this book is an excellent primer.

Split into four sections covering Protocols, Techniques, Algorithms, and Real World Implementations, there are lots of examples and diagrams which are enough to make anyone without a degree in applied maths run for the hills. But if you can ignore those bits, the main text itself is readable and easy to understand. Schneier has a great talent for making such complex issues understandable, and the structure of the book makes it easy to dip into and out of as you wish, to read up on various topics, whether it be DES, RSA, MD5, Elliptic Curve, Public Key, Key Exchange — you name it, it's here. An absolute must for anyone who is even remotely interested in encryption and security.



■ *Maximum Security*
Author (Anonymous)
Publisher Sams
Price £46.95
Yes, another book about security, but quite different from the above. This is subtitled *A Hacker's Guide to Protecting Your Internet Site and Network*, which goes some way to explaining the author's desire to remain anonymous. But this is not a book that a would-be hacker would buy to find out how to ply his trade. Yes, there are plenty of examples of hacks and cracks in here, but no real detail — certainly nothing you cannot find by searching a few dodgy sites on the internet. Instead, this book approaches the problem from the network administrator's viewpoint, intending purely to scare the hell out of you and provide a few pointers towards plugging those security holes.

It starts with a good primer on the internet, TCP/IP and general security issues, before delving into the various cracking tools available and some of the major security loopholes in today's operating systems. There is also a very interesting section on computer security and the law, and the whole thing is sprinkled with useful web addresses to enable the serious enthusiast to bone up in more detail. Oh, and there is a CD-ROM included with a few security utilities for various platforms — but, once again, geared more towards protection (encryption tools, that sort of thing) than cracking. The style is easy to read and much of the information included is well worth having. This one should be on every network administrator's bookshelf.

■ *Thanks to Computer Manuals (0121 706 6000) for keeping me supplied with review copies.*

The best place to begin with file sharing is the Windows Explorer. I will assume that you want to provide access to the CD-ROM, so right-click on the CD drive letter and select the Properties option. Assuming you selected Share Level security when you set up your network (as I advised in a previous column) you will now be presented with a window similar to that in Fig 1.

Here, you can assign a name to the shared resource (something like "BobCD") and one or more passwords. Ticking the Read-Only box allows only read access, while ticking the Full box allows other users to do anything they like on your shared resource. Each option has its own password assigned to it, and if you make these passwords different, then you can tick the Depends On Password box. This provides the appropriate access to other users depending on which of the two

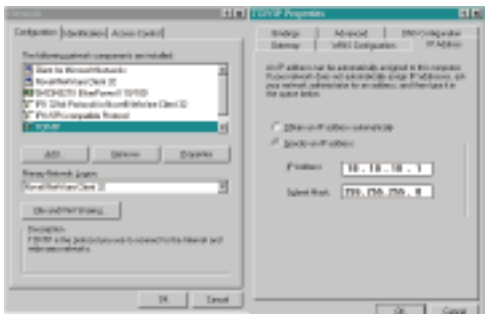
Fig 1 Setting share-level security on a Windows 95 directory

passwords is entered. Once confirmed, that resource will appear on the Browser list of other users on the network, and those

p315 ➢

Questions & Answers

Q I have a small LAN at home which incorporates various platforms, including a Unix box and a couple of PCs. They're all connected via a hub, and running TCP/IP, NetBEUI and IPX protocols. When connecting to the internet, I use one of the PCs which has an analogue external modem.



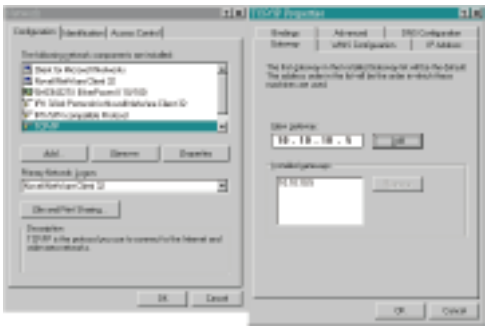


Fig 3 (above) **Assigning IP address and subnet mask**
Fig 4 (left) **Assigning a gateway address**

It uses the "dial-up network" feature in Windows 95 and connects to my ISP via PPP. In future, I would like to use a router to provide instant net access for all the clients on my LAN over an ISDN connection. How do I configure Win95 to use a routed connection instead of dial-up?

Aloysius A. Horn

A Setting up Windows 95 for this is no problem. It is configuring your chosen router that has the potential to cause the most difficulty, depending on your familiarity with TCP/IP and the complexity of the configuration interface of your router. I have to assume that you know how to set up your ISDN router, since there is not enough space here to go into detail (this, along with general TCP/IP configuration, will be covered in future columns).

Firstly you require a LAN connection to your ISP, rather than the usual single-user dial-up account. When your connection is confirmed, you will be assigned a range of IP addresses to use on your internal network, together with an address for the router's external interface (the ISDN port). One of your new IP addresses will be assigned to the ethernet port on the router, and this will be on a different "subnet" to the ISDN port (this is what makes the router "route"). The address assigned to the internal port is the "Gateway Address".

As far as Win95 is concerned, there is a little configuration to do. You obviously already have TCP/IP configured on your client PCs, though you will have to apply the new IP addresses and submask values assigned by your ISP. This is done by firing up the **Network** icon from the Control Panel, double-clicking on the **TCP/IP** protocol and selecting the **IP Address** tab (Fig 3). Once that has been done, you select the **Gateway** tab and enter the Gateway Address which was assigned to your router (Fig 4).

That's all there is to it: no proxies, no special application configuration (note that in Internet Explorer, neither the Dialling nor Proxy Server boxes should be checked on the Connection tab). Once your machine has been rebooted, whenever a net connection is needed, the router will make the call automatically. (*p316* ➢)

users are presented with a login screen similar to Fig 2 (*p316*) whenever they attempt to access it.

Normally, you would not assign a password to unimportant resources such as your CD or printer. You would, however, restrict access to data directories on your hard disk. Documents which are to be shared between several users could be placed in a common directory to which everyone is given Full access. Policy documents which you create, but which are not to be altered by anyone else, could be placed in another directory with Read-Only access. Your confidential documents would be placed in a separate directory that was not shared across the network.

Please remember that in allowing access

p316 ➢

Questions & Answers (cont'd)

Q I read your recent Hands On column about connecting two PCs using a crossover cable. You mentioned the various places you might buy such a cable but neglected to mention how you would go about making your own, so I had a go myself.

The net search revealed I needed to cross-connect lines 1 with 3, and 2 with 6 (four connections only), and the Black Box catalogue provided the RJ45 pin-out diagram (for some reason, I couldn't find that on the net).

I tried using a couple of PDS RJ45-serial adapters (junking the 25-pin RS232 bit) to save butchering network cables. I plugged everything in and loaded TCP/IP onto both machines, and I'm sharing a CD drive, a printer and a decent-sized hard disk between the two.

Ian Hayhurst

A Thanks for the tip, Ian. I didn't mention making your own because it would never have entered my head. Give me a few pieces of working cable and a few PCs and I will build you a network, but getting down to soldering itsy-bitsy bits of wire is too much for my clumsy digits to cope with. Besides, I have this paranoia about connecting expensive bits of hardware together using wire I have kludged myself.

Beware! I have not tested the above tip, so readers use it at their own risk. ■

Fig 2 Login screen when attempting to access shared resources

to a directory on your hard disk, automatic access is granted to all sub-directories, too, so never share the root of your hard drive! I will continue this in future columns, where I will cover advanced security settings together with the use of security policies.

Beware the virus hoax

I received an email from a colleague who thought she was doing me a favour by warning me of a spate of terrible viruses sweeping the internet. It read: *"Please read the attached message about very serious viruses which are being passed on by opening email messages and which can erase whole hard drives.*

"WARNING!!!!!! If you receive an email titled 'JOIN THE CREW', DO NOT open it! It will erase EVERYTHING on your hard drive! Send this letter out to as many people as you can…this is a new virus and not many people know about it!

"If anyone receives mail entitled "PENPAL GREETINGS" please delete it without reading it! It appears to be a friendly letter asking you if you are interested in a penpal, but by the time you read this letter, it is too late. The trojan horse virus will have already infected the boot sector of your hard drive, destroying all of the data present. This virus will DESTROY your hard drive, and holds the potential to DESTROY the hard drive of anyone whose mail is in your IN box, and whose mail is in their IN box and so on. PASS THIS ON TO YOUR FRIENDS!!!"

Unfortunately, I could see from the distribution list that the messages had also been sent to a large number of other people: "unfortunate", because all the virus warnings included in the above message are actually hoaxes. Please be assured that it is not possible to invoke any sort of virus, trojan horse or malicious program of any kind simply by opening an email. But of course, if you should ever receive a suspicious attachment to an email message from someone you do not know, it is best to avoid double-clicking on that.

Along with those mentioned above, Good Times, Irina, Deeyenda, Free Money, AOL4FREE and Hackingburgh are also virus hoaxes. Check out the story of Irina at www.sands.com/vircen/vanalyse/va005.html for an example of a practical joke/publicity stunt that got out of hand.

PCW Contact

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View from the **bridge**

A bridge is just one way of avoiding collisions in advanced network configurations. Routers and switches are equally effective alternatives, and they're all traversed here by Bob Walder.

I recently received an email from reader, F Nelson, requesting some clarification on the terms "bridge", "router" and "hub". Given that recent columns have covered basics such as the connection of just two PCs, I thought that a tutorial on more advanced network configurations might make interesting reading this month.

When most small networks start their life, they are built with all workstations and servers resident on a single segment (i.e. all nodes on the network are physically capable of communicating with all other nodes). This works fine with smaller LANs but can cause problems as the size of the network grows and the increase in traffic causes performance problems.

Collisions are a fact of life when dealing with shared access topologies like Token Ring, FDDI and Ethernet. Such topologies are only capable of supporting a single active "message" (a communication between any two nodes on the network, say) at one time. To make matters worse, Ethernet transmits its packets of data using something called Carrier Sense Multiple Access with Collision Detect — or CSMA/CD for short. It boils down to the fact that all devices on the LAN are free to communicate whenever they want without precedence or order. A device wishing to send data listens on the network (Carrier Sense) and, if no other device is sending, begins to transmit. Of course, it is possible that another device may also transmit simultaneously (Multiple Access), so the devices check for a "collision" of packets (Collision Detect). If a collision occurs, then all devices which were involved will pause for a random length of time (in an attempt to stop packets from the same devices colliding again) before re-transmitting their packets. As you would imagine, the more users you add to an Ethernet segment, the more collisions there are. And, the more collisions there are, the lower the effective bandwidth.

If you have logical workgroups on your LAN (Accounts and Marketing departments, for instance) you will usually find that most of the traffic could be restricted to the workgroup from which it originates. This is particularly true where each department has its own local server, since all relevant data will reside within the workgroup. However, because Ethernet uses a broadcast technique to move its data packets around, every single node on the LAN (not just the ones in the appropriate workgroup) must listen for, and process, the packet in order to determine whether or not the data is intended for them.

Bridges

In such situations, the use of bridges can help. Bridges operate at layer 2 (the Data Link layer) of the OSI seven-layer reference model (Figs 1 & 2, pp313/315). This means they are protocol independent, allowing packets to be exchanged across a network even though the devices using the network do not share the same upper layer protocols (such as IPX, IP, AppleTalk, DECnet etc). Usually however, you are

p313 ➢

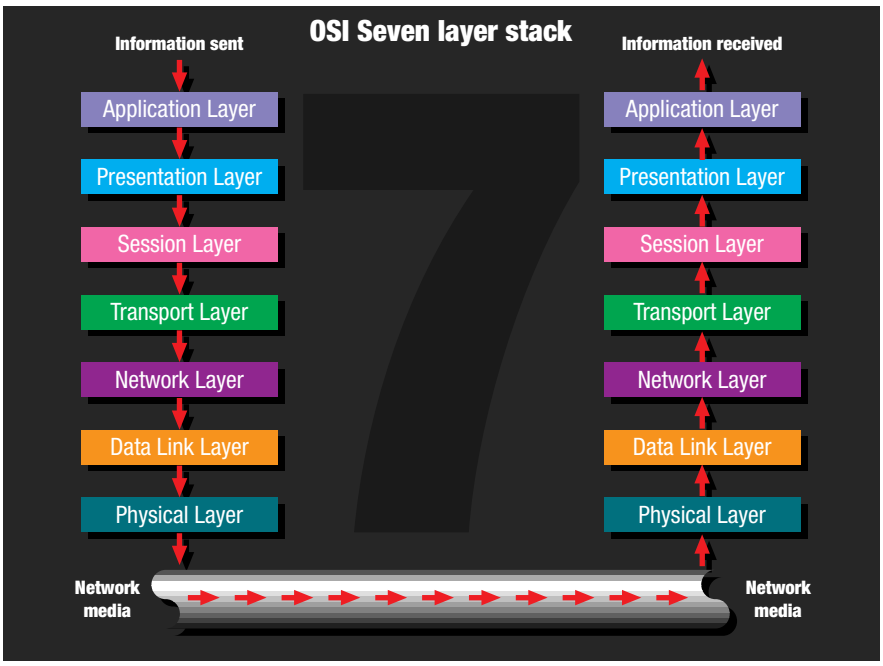

Fig 1 **The OSI stack — what goes on underneath your application**

restricted to the same physical medium throughout a bridged network: that is, you can only bridge an Ethernet segment to another Ethernet segment.

By installing a bridge and splitting the LAN into two segments, performance can be improved dramatically since we can now support two active messages at any one time; one on each segment. Furthermore, it is possible to isolate all intra-segment traffic so that messages between nodes in the Accounts workgroup do not cross the bridge and thus no longer impact on the bandwidth of the "Marketing" segment. However, the bridge is a completely transparent device as far as the user is concerned, and so inter-segment traffic (i.e. messages between Accounts and Marketing) travel across the bridge unimpeded.

Bridges do have their problems, however. If the initial segmentation is not performed carefully, you could find that there is still a lot of inter-segment traffic. If this traffic is regular, the users involved may well find that performance is even worse than before the bridges were installed. This is due to the fact that every time a packet crosses a bridge, a delay is introduced due to the fact that the bridge must store the entire packet before deciding which segment it should be forwarded to. It is additionally possible that the general-purpose processors used in many bridges are actually incapable of moving a continuous stream of packets, which can incur further delays. The time taken to move a packet through a bridge is known as the bridge's "latency".

Even when inter-segment traffic has been reduced to a minimum by careful analysis and segmentation, bridges must still forward all packets which are destined for every LAN workstation. Excessive traffic of this type can still flood all segments, causing an unpleasant phenomenon known as a "broadcast storm" which can bring the network to its knees. What is required is the equivalent of a "firewall" to prevent such broadcast storms. That, plus the need to handle multiple protocols across diverse topologies, leads many users to consider installing routers instead of bridges.

Routers

Routers operate at layer 3 (the Network layer) of the OSI model (Fig 1). They are protocol dependent and have traditionally been used in applications where connections between networks and segments with different topologies (i.e. mixed Ethernet and Token Ring LANs) have been required.

Routers are able to transfer traffic down several different paths (local or wide area connections) and are typically able to dynamically choose the most efficient link. They are also capable of preventing the broadcast storms which can be prevalent in bridged networks.

Bridges are designed to make several attached LAN segments appear to upper-layer protocols as one segment. Since

p314 ➢

Questions & Answers: SMBs, drive letters, users on the loose, and NAL

Q In the Microsoft world, what are SMBs?

Y Sanger

A The Microsoft family of networking products interoperate with one another at different levels, depending on their capabilities. Adherence to the Server Message Block (SMB) command protocol makes this possible. SMBs were designed initially for the MS-Net and PC-Net products in the early eighties and the ability of SMBs to negotiate different dialects is a key feature in their continued use.

Each successive generation of LAN products introduced different and more sophisticated functions requiring new SMBs, and each set of SMBs was given a dialect name. New dialects are supersets of previous dialects (though this is not mandatory).

When two machines want to establish a session, the first SMB transferred from the client to the server contains a list of dialects which the client understands. The server selects the richest dialect (the highest order) from the list it understands and informs the client as to which dialect will be used. This allows an MS-Net workstation to connect to a Windows NT server or, as I mentioned last month, allows a Windows for Workgroups PC to participate in a Windows 95 peer-to-peer network.

Q Is it possible to have the same drive letter mapped to different people or groups automatically under NetWare? I have a number of NetWare groups set up on my server which relate broadly to the organisation structure: ACCOUNTS, SALES, DESIGN, and so on. What I want to do is standardise on a specific set of drive letters to try and keep things as simple as possible for my not-too-technical users.

For instance, just as a standalone user would get used to the fact that the A drive is the floppy and the C drive is where all the programs and data are situated, I would like them to be able to always associate drive G with application programs, drive M with application data files, and drive P as their "personal" storage space on the server.

The problem, of course, is that each set of applications for each department is located in a different directory, as is the data. And every user has their own "home" directory (created when the account was first set up) with a name derived from the user's login name under the LOGIN directory. How do I make NetWare aware of the nature of the user and automatically assign the correct drive mappings?

One other thing I would like to be able to do, if possible, is to prevent users from "roaming" around the server disk having once logged on. Even though we are quite strict on access rights, we still have users who try the old CD\ routine so that a drive which originally pointed to SYS:ACCOUNTS\DATA, suddenly points to SYS:. The result is that next time he tries to run his application, it bombs out with a "Can't find file" type error. Can this be prevented?

A Greaves

A This is a good method of organising your users' network access and is quite easy to accomplish under NetWare — at least with the later versions which support the "IF MEMBER OF" login script command.

Since you have your users organised into groups, you can test for the group name in the system login script and set the drive mappings accordingly. This is accomplished as follows:

```
IF MEMBER OF "ACCOUNTS" THEN
    MAP ROOT G:=SYS:ACCOUNTS
    MAP ROOT M:=SYS:DATA\ACCOUNTS
END
```

Repeat this for each group you have defined, replacing the group name and directory names as appropriate.

There is one significant drawback to this method: it is not possible to have a user who is a member of more than one group, since that user would require two different mappings for the same drive letter. The only way around this would be to allocate two different accounts for the same user (wasteful and messy) or use batch files to load applications and perform the necessary mappings within those (not always practical with Windows applications).

Since you have already elected the one-mapping-per-group approach, I will assume that you do not have this problem and the above solution will therefore work just fine.

The mapping to the user's home directory is also easy to accomplish, since NetWare places the login name in what is known as a "user identifier variable" (see pages 28-29 of your *Quick Access Guide* for a full list of these variables).

The following command will do the trick, which should also reside in your system login script:

```
IF LOGIN_NAME !="SUPERVISOR" THEN
    MAP ROOT P:=SYS:LOGIN\%
LOGIN_NAME
```

So if you were to log in as BOB, the above command would be the equivalent of typing:

```
MAP P:=SYS:LOGIN\BOB
```

Note that if you do not have the LONG or OS2 name space loaded, you can only have directory names which are eight characters long, so you must restrict your user login names to eight characters or less if you want to use this method. This is the reason we first check that we are not logging in as SUPERVISOR (!= means "not equal to") in the above example — it is longer than eight characters and it is unlikely that the SUPERVISOR requires a personal directory anyway. If, however, you load the LONG or OS2 name space, this provides you with long file name support and the above restriction is removed.

With regard to the second part of your problem, users "roaming" around the server disk, that is solved by the MAP ROOT command as specified in the above examples. This "fools" DOS into thinking that the drive mapping actually exists at the root of the NetWare volume, so even if a user tries to CD\ he will remain in SYS:ACCOUNTS\DATA.

Having explained all this, it is worth pointing out that for users of Novell's NDS, there is a product available known as NetWare Application Launcher (NAL) which provides a far more elegant means of achieving the same end, with all management and administration of the users and applications performed via a simple graphical utility.

broadcast messages are designed to go to all workstations on the same segment, bridges cannot, and should not, prevent their proliferation throughout the LAN. Routers do not suffer this restriction and have thus become increasingly popular in recent years for large multi-protocol internetworks with complex configurations.

Routers can be relatively expensive, however, require more in the way of configuration and management than bridges, and some can be limited in the number of protocols they support. For this reason, neither one device nor the other could be considered "best", and most older networks will have a mixture of bridges and routers, with bridges providing the segmentation within a single site and routers handling the wide area connections.

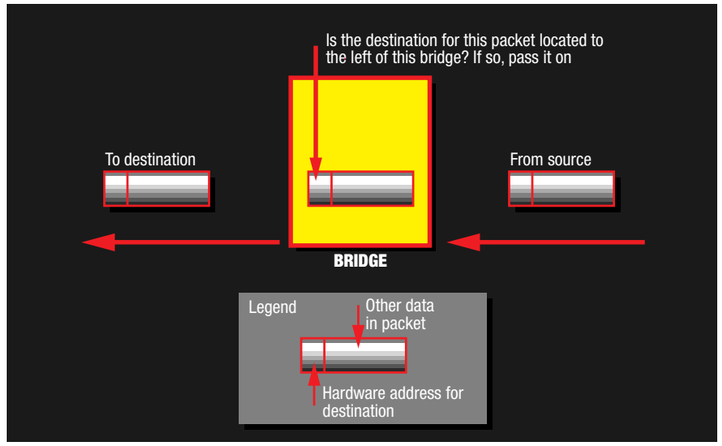

Fig 2 **Bridges allow segmentation of your network**

Switches

While both bridges and routers can help in relieving traffic-flow problems, neither of them actually increase the bandwidth available between file server and desktop. For Ethernet users, that bandwidth is limited to 10Mb/sec, although the contention method of packet transmission used by Ethernet effectively reduces that to around six or 7Mb/sec to be shared between all users on a segment.

One way around this is to use a device called a switch, a connection-orientated device which effectively removes the problems associated with broadcasting packets. On the surface, the switch appears to be little more than a multi-port bridge — although marketing hype will often hotly dispute this. Like a bridge, the switch learns where every node is on the network. When two nodes wish to communicate, a dedicated circuit is established between the two in a similar fashion to a telephone switch. Because each packet travels on its own dedicated circuit and because multiple circuits can be established within the switch, it is possible for multiple conversations to occur simultaneously (up to the maximum aggregate bandwidth limit of the switch); this is the main area where switches differ from bridges.

Some switches offer on-the-fly switching, which means they have only to read the first few bytes of the packet header in order to establish the connection before sending the packet. Others use a "store and forward" mechanism with large buffers and high-bandwidth backplanes. Inevitably such devices do have some latency overhead but this is minimal, and the net result of either approach is a dedicated 10Mb/sec pipe between any two nodes on the network.

■ *To come: ATM and TCP/IP.*

PCW Contact

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French connection

Ooh-ah, Bob Walder has been to France: he reports back on Microsoft's new NT 5.0 being trumpeted at the TechEd gathering. Back at base, he deals with cabling small networks.

I have once again endured the "temptations" of Nice (the hardships I endure to bring you the latest networking news!) in order to find the latest gossip from Microsoft's TechEd conference. Two things immediately hit me. The first was the sheer scale of this sell-out event. With over 3,760 delegates, it is clear that the developer community is squarely behind the Windows platform. Not that we didn't know that already, of course; it's just that when you get the opportunity to compare the difference between this and the recent Novell event in close proximity, you begin to appreciate that Novell has an uphill struggle.

The second thing to strike me was that although my initial impression had been that there were few new products at TechEd, there was in fact plenty of new stuff around (much of which was yet to be released) but I was already familiar with most of it. Once again, this just goes to illustrate the difference between Novell and Microsoft's marketing methods. I mentioned last month that I saw a few technologies at BrainShare about which I had heard nothing previously, the result of a somewhat lacklustre marketing approach on the part of Novell. In stark contrast, Microsoft's marketing machine is always in overdrive, so by the time you get a first glimpse of a new product at TechEd, you already feel as if you have been using it for years.

A case in point was Windows NT 5.0 (formerly "Cairo"). We have heard so much about it, that it came as something of a surprise to learn of further new features: networking and routing enhancements, improved manageability, increased fault tolerance and performance, new power management and plug-and-play are all on the cards. But the most interesting additions are in the area of distributed services, with a new distributed file system, distributed public/private key security and, of course, Microsoft's answer to Novell's NDS — Active Directory (Figs 1 & 2). There is even a new centralised administration utility based on snap-in modules, called the Microsoft Management Console (Fig3), which bears a close resemblance to Novell's Nwadmin. Strange to think, given the widespread acceptance of NT Server, that Microsoft is still technically playing catch-up with Novell in many areas. But with each release, Microsoft gets closer, and even shows signs of sneaking ahead in some areas.

This will reduce most of the arguments for and against either operating system to a purely sectarian level. Each will have its strengths and weaknesses, but ultimately, they will both provide file and print services, a strong security model, distributed file systems, internet connectivity, clustering,

p298 ➢

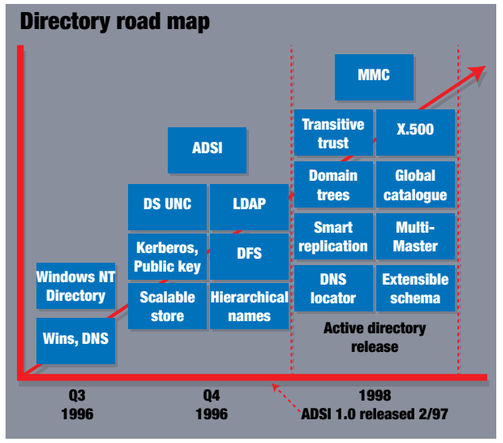
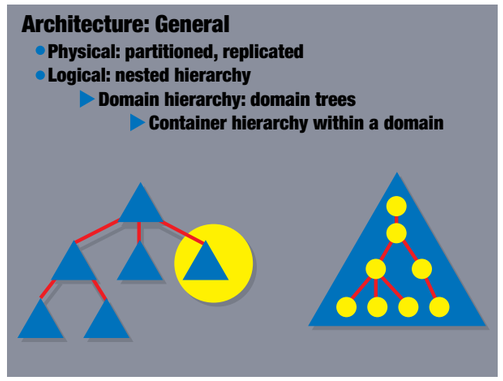


Fig 1 Microsoft Active Directory road map. (From Microsoft PowerPoint slide)

Fig 2 Microsoft Active Directory architecture (shows concept of domain trees on left and hierarchical Organisation Units within a domain on the right)



and a single point of administration via directory services.

What you choose will ultimately come down to personal preference and application support and availability. If you take the relative scale of the two developer conferences as an indication of future application support, this could mean grim times ahead for Novell.

Cabling: the long and the short of it

"Using a PC at home, I'm interested in adding a neighbour's PC to our LAN (using thin Ethernet) for (ahem!) "recreational" purposes. I've asked a number of people whether it is possible to drag a length of RG58 cable outside through the garden, and have received a mix of answers. But how far can the cable reach before the signal becomes too weak?"

Ben Hindmarch

Should I really be encouraging the playing of Doom over the network? All over the country, I can see network administrators cowering and gibbering in a corner at the thought of their users going into work next week, full of ideas for implementing this wonderful network "stress-testing" tool.

However, Ben's query does raise one or two serious issues which I think are worth addressing here. The first is that of slinging a piece of thin Ethernet cable between two buildings. I am pretty sure that any cabling expert to whom you speak about this will hold up their hands in horror and suggest all manner of more expensive ways of doing it.

In the dim and distant past I used to be the IT manager of a large manufacturing company with a sprawling site consisting of two or three separate buildings. I had to provide network facilities to one of these buildings which was about 30ft away from the main office structure, with a road in-between. I had neither the time nor the budget to install a fibre optic cable under the road, so implemented a quick-and-dirty solution by stringing a piece of rope across the chasm at a first floor level and attaching a piece of thin Ethernet coax cable to it with several pieces of string. This allowed me to span the gap without putting too much strain on the Ethernet cable, and this "temporary" fix lasted over two years before we finally got around to putting in the fibre — and it never gave us a day's trouble.

In other words, Ben, I think you should get away with your improvised network as long as you take some basic precautions in protecting the cable.

The second issue is that of cable length, and I think it is worth spending a couple of minutes on the limitations inherent in the most popular cabling schemes. Thin Ethernet cabling uses RG-58/U, 50-ohm coaxial cable in a bus configuration, and the length of a segment (i.e. the distance between any two PCs) cannot exceed 185m (607ft): I would have thought this would be enough for Ben's application. In a larger network, up to five trunk segments can be connected through four repeaters (a repeater boosts the signal and counts as a node on the network) and the entire network trunk cannot exceed 925m (3,035ft).

Twisted-Pair Ethernet cabling, also known as 10Base-T or UTP (Unshielded Twisted Pair) uses twisted-pair cables (similar to telephone wire) in a star-shaped configuration. Each node (PC) attaches to a hub (or concentrator) via a twisted-pair cable using RJ-45 connectors (similar to a telephone jack).

The maximum length of a UTP segment is 100m (328ft) and you can have no more than 1,024 segments in total. The maximum number of repeaters is four.

Because of the ten-fold increase in speed, these distances are reduced for 100Base-T. Fast Ethernet allows up to 100m between a network node and a hub, and allows cable lengths of 10m between two hubs. The rules specify a maximum of two hubs between any two nodes, making the maximum network span just 210m, in sharp contrast to the 10Base-T rules.

The final topology in common use today is Token-Ring. This is a token-passing network, where each node attaches to a device called a Multiple Access Unit (MAU) that sends the token from one node to the next in line. Token-Ring cabling uses IBM type-6 cable in a ring configuration. Each node must attach directly to a MAU, and each MAU can be connected to another, via a patch cable, to form a ring. If the total number of nodes on the network is less than, or equal to, eight (the number of connections on the MAU) only one MAU is required.

The maximum number of nodes in a Token Ring network is 96, and the maximum number of MAUs is 12. The maximum patch cable distance between a MAU and a node, or between two MAUs, is 150ft, while the maximum patch cable distance connecting all MAUs is 400ft.

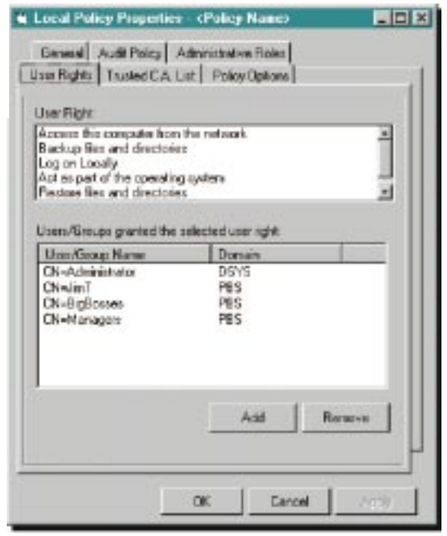


Fig 3 Setting security policy properties in the new Microsoft Management Console

Cabling a small network

"I have a small network of ten PCs to install, and would appreciate your advice on which form of Ethernet cabling to use: 10Base-2 or 10Base-T? Two or three of the PCs will be considerable distances from the others, so I'd like to know the maximum distances which can be spanned by cabling runs."

John Isaac

This question follows on nicely from the previous one; you should refer to this, John, to check out the cable limitations. So let's deal with the question of 10Base-2 (another name for thin Ethernet) and 10Base-T.

It often comes down to cost, which is a shame. When starting out, many sites will use thin Ethernet since it is relatively easy and inexpensive to install, particularly if all the PCs are in close proximity. The main problems with thin Ethernet are its limited expansion potential and no easy upgrade path to newer, fast Ethernet, technologies.

UTP cabling offers a far more structured approach, allowing you to reduce the amount of wire trailing around your building by situating hubs at strategic points. Management, down to the workgroup or individual node level, can be more effective with a UTP solution, since each of the hubs can contain management intelligence.

Because of the increased hardware requirement (in the form of hubs) however, 10Base-T can initially appear to be more expensive than thin Ethernet. It is often difficult to justify the higher initial outlay on a project which usually starts out as an "experiment", but If there is one thing that can be counted on, it is that your network will continue to grow and these "experiments" frequently have a habit of turning into the life-blood of the company. At this point, you will reap the benefits of a more structured approach from the outset.

There is one additional cost worth absorbing from the outset, and that is to use Category 5 cabling throughout (all four pairs). Once again, it may be difficult to justify the initial expenditure on cable which is over-specified for your initial requirements, but it will provide maximum flexibility when the time comes to move to faster technologies like 100Base-T (fast Ethernet) or even ATM, and could well save you a fortune on future re-cabling costs.

Security fears

"I have heard a couple of worrying rumours regarding security issues with some Microsoft products. Specifically, these were to do with some sort of 'denial of service' attack on Internet Information Server and a password vulnerability issue under Windows 95. I have been unable to discover further information, but since my company uses both products I am keen to learn as much as possible about the alleged problems and any known solutions. Can you help?"

A. Smith

Microsoft has indeed identified an Internet Information Server issue that can result in a successful "Denial of Service" (DoS) attack.

It is important to recognise that this particular issue does not affect NT Server itself, neither does it provide the means to access sensitive corporate data in any way; the result of the attack is simply that IIS becomes unavailable for a period of time, and this can be remedied by restarting the web server. For more information, read the bulletin on the IIS web site at www.microsoft.com/iis/iisnews/hotnews/issue.htm. Microsoft has responded with a permanent fix that prohibits this specific type of attack, and also records the IP address of the attacker in a log file. The

p300 ➢

Tip of the Month: Preserving the Registry

Every now and then I would like to share one or two pearls of wisdom with you; little points that do not merit a feature in their own right but which have been garnered, often at the expense of a few grey hairs and sleepless nights, both of which I would like to spare you.

This month's tip is fairly straightforward, and applies to any of the new Windows operating systems which are registry-based (Windows 95, NT Workstation and NT Server).

Whenever you are installing new products which require several updates to the Registry, make sure you reboot the machine between each update. For instance, if, when loading a new piece of software, you need to install a new protocol in order to support it, you should go ahead with the protocol, then reboot the machine before finally installing the software. This does make the whole process somewhat lengthy on occasion (especially when several reboots are necessary) but can save you considerable heartache at a later date, since it ensures that the Registry is updated and stored correctly each time it is changed.

I once managed to completely wreck an NT Server by installing several products one after the other, without rebooting between each. Eventually, the Registry became so corrupt that the machine was unusable. Results are not always this extreme, but problems are likely unless you follow this advice. I have never been able to ascertain whether the problem lies with poorly written application software or with the operating systems themselves. I suspect the latter, but either way, you have been warned.

hot-fix can be downloaded from the Microsoft FTP site at ftp://ftp.microsoft.com/bussys/winnt/winnt-public/fixes/usa/nt40/hotfixes-postSP3/iis-fix.

The second issue you mentioned regarding Windows 95 is also fairly minor, involving the vulnerability of network passwords on computers running Windows 95 to a malicious program. If a computer running Win95 is left unattended while a user is logged on to a network, it may be possible to obtain that user's network password by a programmatic examination of the computer's memory. Typically, accomplishing this would require physical access to the computer, although the network password could potentially be acquired if a malicious program designed to search for passwords, via the same examination of memory, were to be downloaded and run by a currently logged-on user.

I am not aware of any instances where this vulnerability has been used to gain access to customers' networks. However, Microsoft recommends the following precautions to prevent the current user's network password from being accessed by unauthorised means:

- Log off the network when leaving the computer for long periods of time.
- Run a password-protected screensaver when leaving for a short duration.
- Do not run mistrusted programs on the network, the web, or received via email.
- Install the security update for Windows 95 as follows:

Step 1. Download the appropriate update file (from the list, below) to an empty folder;

(a) If you are running Win95 Retail Release (version 4.00.950) or OEM Service Release 1 (OSR1, version 4.00.950 A), download SECUPD.EXE. Double-click the System icon in the Win95 Control Panel if you are unsure of exactly which version you are running.

(b) If you are running Win95 OEM Service Release 2 or 2.1 (version 4.00.950 B), download SECUPD2.EXE.

(c) If you're running the Microsoft Client for NetWare Networks with the Microsoft Service for NetWare Directory Services (MSNDS) installed, *also* download NWREDUP4.EXE. You can see if you're running this service by double-clicking the Network icon in Control Panel. If "Service for NetWare Directory Service" is listed, this fix is applicable.

Step 2. In My Computer or Windows Explorer, double-click the update file(s) you downloaded in Step 1.

Step 3. Follow the instructions on the screen and reboot your machine.

PCW Contact

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Mind games

Bob Walder returns from BrainShare. Nothing sci-fi or sinister, but snippets from Novell's recent technical conference. And advice from Microsoft turns out to be worryingly wrong.

I am always amazed by how invisible Novell's marketing is. Just look at what happened to GroupWise, for instance. Novell had a robust, scalable, widely installed enterprise messaging system available while Microsoft Exchange Server was still a twinkle in Bill Gates' eye. And yet what did Novell do to capitalise on its lead? Nothing.

Bringing things a little more up to date, how many of you have heard of Wolf Mountain? No, not the big lump of rock in the US, but the codename for Novell's answer to Microsoft's Wolfpack clustering initiative. Yes, Novell has clustering, and I have seen it working, too. But have we heard anything about it? Nope.

Every year I find myself lulled into believing that Microsoft is about to achieve world domination and that Novell is about to roll over and die. But my eyes were well and truly opened once again this year at Novell's technical conference, which is called, somewhat appropriately, BrainShare.

Followers of fashion

It is a fact of life that NT is seen as the up-and-coming platform, and is certainly very "fashionable" right now. In contrast, NetWare is regarded almost as a "legacy" system, and is thus frequently lumped into the same class as IBM mainframes, COBOL and the Model T Ford (or any Ford, for that matter), particularly by the "younger" computing generation which has grown up with Windows.

But the astute networking person will buy a product based on "fitness for purpose", and in this area NetWare still has an awful lot going for it. For a start, it is by far the easiest operating system to manage, thanks largely to Novell Directory Services (NDS). The thing is, NT Server manages to fool people into thinking that it is easy to manage by adopting the exact same graphical interface as the user's desktop operating system: "If I can master Windows 95 then NT must be a cinch, right?"

Only when the network is installed does the hapless administrator begin to realise how difficult NT can be. Adding new users, adding printers and particularly assigning user rights to files and directories are all very much more straightforward under NDS. And don't even get me started about adding new network cards or disk controllers. Changing a hardware component under NT can render your system unusable if something goes wrong, whereas under NetWare you are always in control.

Don't get me wrong, I am certainly not "anti-NT". My company runs both NT and NetWare servers, each employed according to its fitness for a specific purpose — our biggest NT box (a superb Olivetti dual-processor server) hosts Exchange Server, for instance.

On the Border

The biggest problem is that Novell simply will not shout as loud as Microsoft. When you think of an internet/intranet platform, for instance, you will probably consider NT first. I certainly did. So it came as a pleasant surprise to see Novell's Border Manager demonstrated at BrainShare this year.

Border services are those which act at the junction between our corporate networks and the internet, and Novell has been working hard in this area. The resulting product set includes a packet filter firewall which can handle both IPX and TCP/IP traffic, the fastest proxy cache server currently available, circuit gateways, Virtual Private Networking (VPN), integrated DHCP/DNS and remote access capabilities. Once again, manageability is the key, with Novell's solution offering the unique ability to easily manage net access to the individual user level through NDS, all from a single point of administration across the enterprise.

Vamping it up

NetWare itself (or IntranetWare, as it is now called) is also due for a major revamp in the near future. Currently codenamed Moab, this will bring a number of significant new benefits including native TCP/IP, an enhanced Multi-Processing Kernel (MPK), integrated DHCP and DNS servers managed via NDS, built-in Java support and a massively scaleable file system called Novell Storage Services (NSS).

For the first time, therefore, Novell customers will be able to run either or both native IPX and native TCP/IP across their networks, and will be able to employ a fully integrated DHCP and DNS solution which is currently the only one available to be managed completely via NDS. DNS domains are represented by containers within the NDS tree, and the DHCP server is BOOTP compatible (unlike the Microsoft one).

On the hook

There is also, finally, an inkling that Novell is prepared to play Microsoft (and others) at its own marketing game. Novell Replication Service (NRS) is a dedicated file system tool for replicating, distributing and synchronising information across a network of geographically dispersed servers, improving fault tolerance and making key files available for quicker access locally. A significant new product, then, which leverages the existing benefits of NDS — and yet Novell plans to offer it free (the actual shipping version, not just a beta) for the first nine months or so, only charging for the product once version 1.1 is released. This "give it away to get 'em hooked, then charge 'em for it" approach to product marketing has been employed by every man and his dog for the last year or so, and it is not before time that Novell seems to be catching on.

Microsoft might appear to be the Spice Girl of the networking world at the moment, but there is many a good tune played on an old fiddle, so don't write Novell out of the story just yet!

Service Pack 1: How and why

Q. *"In a recent issue you mention the need for Service Pack 1 if installing Office 97 with the original Windows 95 or upgrade version of Windows 95. You didn't mention why. Can you explain — briefly?"*
Dave Griffiths

A. There are few things more irritating than being told to install something without being given a reason why, aren't there? Well, Dave, here is the gospel according to Microsoft, so you can judge for yourself. The Windows 95 Service Pack 1 is a collection of add-ons and updates for the released version of Windows 95. Previously released add-ons for Windows 95 included in this Service Pack are:

- Microsoft 32-bit DLC Protocol for Win95
Microsoft Exchange Update
- Microsoft Internet Explorer 2.0 (hopefully you will have a later version of this by now!)
- Microsoft Service for NetWare Directory Services (MSNDS)
- Microsoft Windows 95 Infrared Driver (IrDA) version 1.0
- Microsoft Windows 95 SLIP and Scripting Support for Dial-Up Networking
- Microsoft Word Viewer for Windows 95

Tools for use with Windows 95 Scripted Installation and Network Management included in this Service Pack are:

- Microsoft Batch Installation Utility for Windows 95
- Microsoft INF Generator Utility for Win95
- Microsoft INF Installation Tool for Win95
- Microsoft Support Assistant for Win95
- Microsoft Systems Management Server PDF File
- Microsoft Windows NT Server Management Tools for Windows 95

But possibly the most important bits are the bug fixes and patches:

1. OLE32 Update. The Windows 95 OLE 32 update addresses file-management behaviour in Microsoft Word, Microsoft Excel, and Microsoft PowerPoint for Windows 95.
2. Microsoft Windows 95 Shell Update. This update to the Windows 95 Shell32.dll file fixes a problem in which files copied onto themselves can be truncated to a zero-byte file size (oops!). This update to Shell32.dll also makes it possible to browse Novell Directory Service printers from the Add Printer wizard.
3. Windows 95 Common Dialog Update for Windows 3.1 Legacy Printer Drivers. In Windows 95, when 32-bit applications print using Windows 3.1 monolithic drivers or the Windows 3.1 Pscript.drv / Unidrv.dll driver, the applications sometimes fail. This update addresses that problem.
4. Vserver Update: File and Printer Sharing for Microsoft Networks. An update for a known problem with File and Printer Sharing for Microsoft Networks and a certain UNIX shareware network client (Samba's SMBCLIENT). The update corrects a problem with share-level security.
5. NWServer Update: File and Printer Sharing for NetWare Networks. This addresses an issue with File and Printer sharing for NetWare Networks which might affect data security for corporate users.
6. Vredir Update. The Vredir Update fixes a problem that affects only Windows 95 users who use UNIX Samba servers.
7. Windows 95 Password List Update. The Windows 95 Password List Update protects your password file against potential security violations.
8. Microsoft Plus! Update (System Agent Update). The Microsoft Plus! Update provides an updated version of Sage.dll to fix a minor problem with System Agent: When version 1.0 System Agent is running, programs that perform floating-point calculations might be slightly off in precision.
9. Printer Port (Lpt.vxd) Update. The Service Pack 1 will install a version of the parallel port driver (Lpt.vxd) that was available previously

p271 ➢

on the Win 95 CD in the \Drivers\Printer\LPT folder. This driver corrects problems seen on some ECP (Extended Capabilities Port) equipped machines.

All things considered, I would advise any Windows 95 user to install Service Pack 1, whether or not they intend to run Office 97.

Service Pack 1: Which one?

Q. *"You recently mentioned the need for Service Pack 1 when running Windows 95 and Office 97 together. Can you please tell me which version of SP1 I should use, and from where it can be downloaded?"*
Mr A Mallik

A. Well, Mr Mallik, there is only one version of SP1 available (unless you count the different language versions) and that can be downloaded from the Microsoft WWW site. Try www.microsoft.com/windows/software/servpak1/sphome.htm. After installing the update, go into your Control Panel and double-click the "System" icon. On the "General" tab, the version number will be reported as 4.00.950a.

Will WFWG and Win95 work?

Q. *"In the May 97 Networks section of PCW, the last paragraph read, '...is it possible to connect WFWG to a machine with Win95?'. Mark Baynes replied that it is possible and that he does it all the time. Looking for confirmation, I phoned Microsoft who denied this was possible. Can it be done? And if so, what do you have to do in order to run a mini-network?"*
E Clark

A. I must confess to being a little perturbed by Microsoft's response. You would think that the technical support line of a company would know its products inside out, and that makes me slightly nervous, since I am about to contradict their words of wisdom.

You see, the bottom line is that Windows 95 uses the same workgroup model and underlying protocols as Windows for Workgroups. Because of this, computers running File and Printer Sharing for Microsoft Networks can be seen by computers running Windows for Workgroups. The only real caveat (which shouldn't cause any problems in most situations) is that Windows 95 computers will be favoured in Browse Master elections because of the higher version number of the browser software.

A user running Client for Microsoft Networks can therefore access the shared resources on a computer running Windows for Workgroups, providing both computers are using a common protocol. Conversely, a user running Windows for Workgroups can connect to the shared resources on a computer running File and Printer Sharing for Microsoft Networks, providing both computers are using a common protocol and the user has been granted access to the resources on the computer running Windows 95 (don't forget this last point).

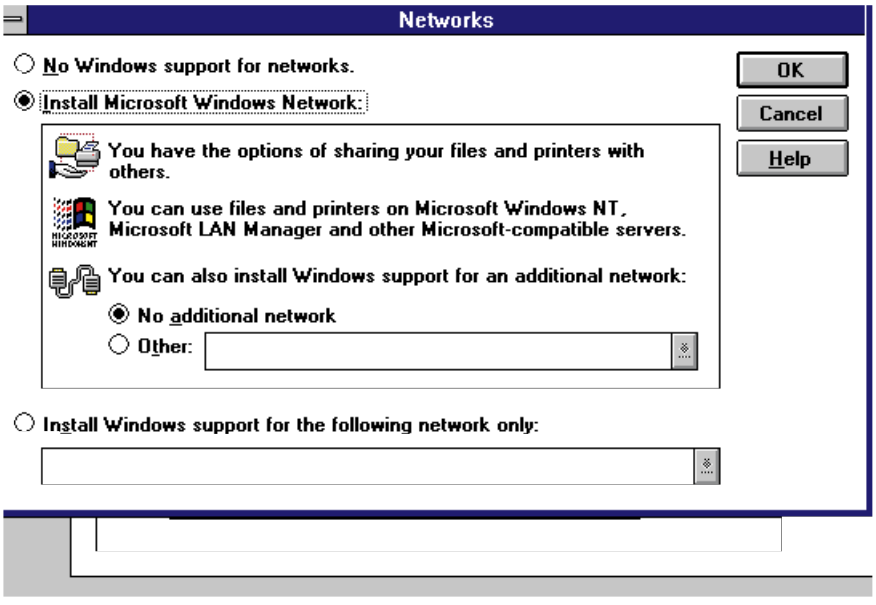
The protocol issue is worth stressing, since it tends to be forgotten, especially when attempting to resurrect older machines and incorporate them in a new network. It can also cause problems, since many newer Windows 95 networks will be running TCP/IP, a protocol which carries quite a heavy resource overhead and which can often be difficult to implement on older machines with limited memory. In such cases, you can always resort to NetBEUI (the default protocol of pure Microsoft networks) or the commonly used "IPX/SPX Compatible Transport With NetBIOS".

The Windows 95 machine is configured for networking in the manner I described last month. When configuring the Windows 3.11 machine, it is vital to ensure that you have the user name and workgroup name set correctly. To do this, fire up the Windows Setup utility from the Main program group, then select Options and Change Network Settings. Here you will be presented with three buttons.

"Drivers" allows you to install the appropriate support software for your network card. "Sharing" allows you to specify whether you wish to make your disk and printer resources available to others. If you do not, check any boxes in the "Sharing" section, then even if the rest of your network is configured correctly, you will not be able to access resources on the Windows 3.x machine. The final button is "Networks", and here you should click on "Install Microsoft Windows Network" (to keep things simple initially, check the "No additional network" box too — you can always add additional network support later once everything else is working).

When you confirm everything you will be presented with the Network Names box, where you can enter the user name, workgroup name (make sure this is identical on all machines, Win95 or Win 3.x, which need to communicate with each other) and unique computer name. That's all there is to it. If anything does not go according to plan, try the approach we used last month: remove all networking first, reboot the machine, then start from scratch.

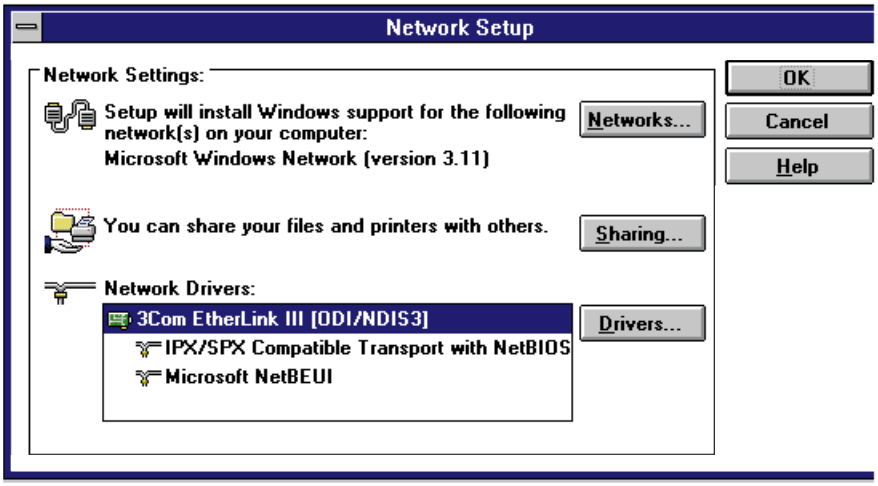
Try it: I am sure you will find it works. As

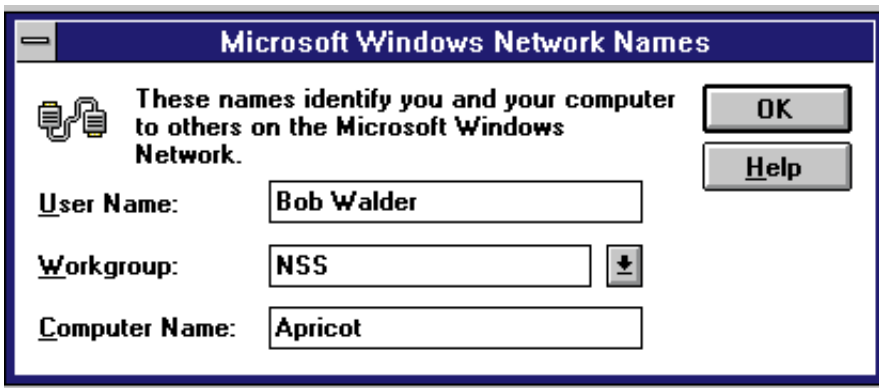


Adding Microsoft Network support in Network Set-Up utility

Adding Network Adapter

p272 ➢





Top Network Set-Up screen after installing network support and adapter
Above The final step — assigning the user, computer and workgroup names

Book Review

Title Internet Firewalls and Network Security
Author Siyan & Hare
Publisher New Riders
Price £37.49 (inc CD)
Although this book starts off with a brief history of the internet and a tutorial on IP addressing, it is far from a beginner's book. It rapidly moves into a discussion of UNIX configuration files, which will be completely superfluous to those readers whose primary interest is NT. By chapter three we are back on generic ground, with a very useful section on how to go about defining your own corporate security policy — something everybody should do. The second part of the book looks in detail at firewall architectures and theory of operation, and provides plenty of advanced reference material. Then it goes and spoils itself again by getting product specific, spending whole chapters on particular firewall implementations and toolkits. I never feel this is a good idea, since it means the book is out of date even before it is published. Although there is a whole chapter on FireWall-1, for instance, there is no mention of the NT version, even though it is a well-established product on the NT platform. Weak points of this book, therefore, are the total UNIX orientation (ignore this criticism if you are a UNIX boffin) and extensive product-specific chapters. However, if you can ignore those bits you are left with a reasonable (if now slightly expensive) reference work on security policies and firewall architecture.
■ *My thanks to Computer Manuals (0121 706 6000) for keeping me supplied with review samples.*

for Microsoft's advice? Perhaps we are seeing the beginning of the end of effective Windows 3.x support. To be fair, the company does have a huge product portfolio and cannot be expected to support every version of every product indefinitely.

PCW Contact

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The cable guy

Bob Walder is your new man on Networks. He begins by explaining how to make the best connections, and takes you through cabling and the ins and out of correct configuration.

Many correspondents to this column seem concerned with the basics of networking, so this seems like a good place to start. In the future, I will be concentrating on the most popular products used in most networking applications. But I won't be concentrating exclusively on the basics: I will cover the spectrum of networking, including management, groupware, Branch Office/Small Office connectivity issues *et al*.

A couple of letters reflecting readers' concerns come from Scott Walker and Chris Thomson, both similar in content. Chris writes: "*I was interested to read John Rowlatt's letter, in the June issue column, relating to the linking of two PCs together, using only Windows 95. I have tried this between my Dell Optiplex GXMT5133 (built-in 3Com Etherlink III 3C509b-TPO network card) and my Compaq Prolinea 5100, with an NDC NE2000 card (configured as a Novell/Anthem NE2000 compatible), but with no success. The 3Com help files even give instructions on how to set up a 'peer-to-peer network by creating the same Client for Microsoft Networks' on each PC with 'IPX/SPX-compatible Protocol' and using the 'File and printer sharing for Microsoft Networks' network service.*

"*Am I missing something obvious? I have used a standard Category 5 cable between the two PCs and both individually show the relevant Workgroup in Network Neighbourhood but they don't seem to talk to each other. Diagnostics on both cards pass OK and they are configured OK in Win95 (no conflicts). My eventual aim is to purchase a mini-hub, as my business is likely to expand to another PC soon and we will all want to share the one HP DesignJet 250C plotter (we all use AutoCAD, hence the A0 plotter) and be able to access files (drawings) between PCs. Should my current setup work? Or do I need to consider a mini-hub to link the two PCs?*"

OK, two things here. The first is to deal with why your current setup will not work, and the second is to take a general look at configuring peer-to-peer networking under Windows 95 so you can check that you have done everything right.

If you need to connect two or more PCs without using a 10Base-T hub, the only way to do it is to use Thin Ethernet. Standard Thin Ethernet (also called 10Base-2) coaxial cable is readily available and easy to use. Whenever you buy a network card with a BNC (Thin Ethernet) connector, you should also get a small T-shaped device called a T-connector. This is plugged into the card's BNC connector and the Thin Ethernet cable can then be connected between the two PCs. You can connect as many PCs together in a chain as you like (although there are distance restrictions) and you will always be left with two spare connectors; one at each end of the chain. Each should be fitted with a "Terminator", a plastic or metal-tipped "cap" which is also supplied with some of the better quality Ethernet cards. Do not try to connect a single piece of coax cable directly to the BNC connector on the network cards — it will not work. You must use the T-connectors and terminators.

Once, this Thin Ethernet stuff would have been your best option until 10Base-T arrived. Now we no longer connect PCs in a chain but with a "star" configuration, with a hub at the centre. Each port of the hub is connected to a PC, or to another hub, and all communications go via the hub. This provides more flexibility in cabling our networks, and uses lighter and cheaper cable which resembles telephone wire (*don't try to use telephone wire!*).

Standard 10Base-T cable is designed to connect a PC to a hub, not a PC to a PC. The signalling simply will not work, which is your problem in a nutshell. If you want to use 10Base-T, you should be investing in a hub: small four-port devices can be had for around £50 these days. But Thin Ethernet cable is even cheaper, provided your card has connectors for both 10Base-T and Thin Ethernet. If your card supports only 10Base-T connectors, there is one other possible option, provided you only want to connect two PCs.

When you need to connect two hubs which do not have "cascade" ports, or when you need to connect a file server directly to a router, say, you use something called a "crossover cable". Externally this looks exactly like a standard UTP cable, except the pairs of wires within the outer sheath are arranged slightly differently.

Using a crossover cable plugged directly into the UTP ports of your network cards may provide the breakthrough you are looking for (though I cannot guarantee it will work). Unfortunately, crossover cables are not as readily available as standard ones, so if you are treated to a blank stare when you ask for one, get out of the shop quickly and try a more specialised retailer, or order one from the Inmac catalogue.

Scalpels out!

Next, call up your Control Panel and double-click the Network icon to bring up the network configuration window (Fig 1). We're going to try some drastic surgery now, to make sure we are starting from a solid base. So, scalpels at the ready, and have your Win95 CD-ROM or floppy disks to hand.

p285 ➢

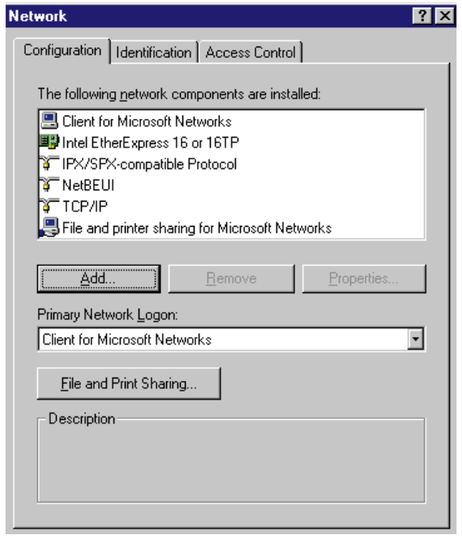

Fig 1 Network configuration window

First, select the line which has the network card icon (Intel Ether-Express in Fig 1) and click on the Properties button. Make a note of the adapter manufacturer and type, together with the current resource settings, as you will need these later. Now, back to the Configuration screen. Make sure the network adapter is still highlighted and click on the Remove button — "hey, where did all the networking stuff go?"

Don't panic: we are now going to add everything back, step by step. But first you should click on the OK button and restart your machine, just to make sure that everything has really gone.

1. Once your machine has restarted, click on the Network icon in the Control Panel again, and on the Configuration tab, click the Add button.
2. In the Select Network Component Type dialog box, double-click the type of component to install, as shown in the list in Fig 2. We are going to add our adapter.
3. Up will come a two-pane window with a list of manufacturers and a list of the network card drivers. Select your manufacturer (Intel, in this case), then select the appropriate network card (EtherExpress 16 or 16TP), and click OK.
4. If, however, you have a driver disk which was supplied with your network card, you are better off using those drivers. Click on the "Have Disk" button, and browse the floppy disk looking in the root or Win95 (or however it is named) directory for a file with the extension .INF. Highlight this file, click OK, and you will get a list of the network card drivers which are on the disk. Select the appropriate one. You have now caught up with the rest of us.
5. When you return to the Configuration screen, you should see the Ethernet card, the Client for Microsoft Networks and IPX/SPX Compatible Protocol components, and the Primary Network Logon should be the Client for Microsoft Networks.

If any are missing, or if you later delete them by accident, they can be added manually. Click on the Add button, select Client, Microsoft, and you can install the Client for Microsoft Networks. Clicking Add/Protocol/Microsoft will let you add the IPX/SPX Compatible Protocol.

6. Back on the Configuration screen, select Client for Microsoft Networks and click Properties. Ensure that the box "Logon to Windows NT Domain" is *not* checked, and check the "Quick Logon" box. Click OK.
7. Select your ethernet adapter and click Properties. In the "Driver Type" tab, ensure you are using the Enhanced Mode NDIS Driver. The Bindings tab should show a check box next to the IPX/SPX Compatible Protocol. You can ignore the Advanced tab for now but the settings on the Resources tab should be changed if necessary to match those set on your ethernet card. This is the trickiest bit, since every network card is different. Some require you to set jumpers or DIP switches on the card, some let you make the changes in software, others are fully plug-and-play.

You must determine what hardware settings are used (e.g. interrupt and I/O address range) and ensure that the settings on this screen match whatever you have set on the card. Then click OK.

If you need to troubleshoot your network

p286 ➢

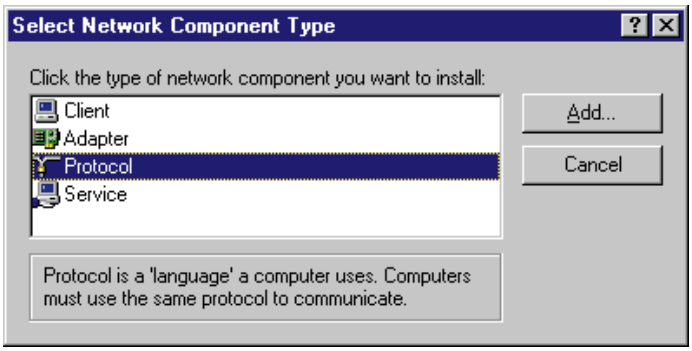

Fig 2 Network component window

adapter at a later date, you will need to go to Control Panel/System/Device Manager/Network Adapters. There you can view the existing resources used by the adapter, check to see if they clash with any other device in the system, and change them if necessary. If you are not using plug-and-play devices, remember to change the settings on the adapter itself so they always match those you set within Windows 95.

8. You can have a look at the properties in the IPX/SPX Compatible Protocol screen if you like, but there are no changes to be made.

9. Presumably, you want to share disks and printers between your networked PCs, so click the File and Printer Sharing button and check the boxes which are applicable (if you are not sure, check them both). Click OK and you will see the "File and Printer Sharing for Microsoft Networks" entry appear on your Configuration screen.

10. Move on to the "Identification" tab. Win95 requires you to define a workgroup and computer name for each networked computer, independent of the type of networking software you use. First, you give your computer its name: keep it simple, use 15 characters or less, and make sure that every computer on your network has a *unique* name. This is very important.

11. The default Workgroup name is WORKGROUP. You can leave this as it is, if you are creating a network from scratch, but if you change it, you must make sure that it is *identical* on every PC on your network. For those of you who are adding a Win95 client to an existing network, this should be the same as that used on all existing PCs, or should be the existing NT Domain name if you want this PC to act as a client to an NT Server (I will cover using Win95 as a client to NetWare and NT servers in more detail in a future column).

12. The description field is for information. Do with it as you will. However, this field is displayed as a comment next to the computer name when users are browsing the network, so it might be helpful to put something descriptive in here, like "Bob's Computer in Accounts".

13. In Access Control tab make sure the "Share-Level Access Control" box is checked.

14. The configuration is now complete, so click OK. You will be prompted for many disks or your Win95 CD-ROM at this point, following which you will be asked to reboot your machine.

15. When backing up, you should be asked for a user name and password, and if creating your network from scratch, you can make these up (try to remember them!).

16. You should be able to browse the network using the Network Neighbourhood icon and the workgroup you created should be visible, as should all Windows 95 clients in the same workgroup as your own PC.

17. Even though you can see the other machines in your workgroup, you won't be able to do much with them until you have created some shares. Bring up the "My Computer" window and right-click on the C: drive. If your networking is functioning correctly, there will be a "Sharing" option on the menu.

18. Select "Sharing" and check the "Shared as" box. The share name will default to "C", and you can leave it as this or give it a more descriptive name.

19. Under "Access type", check the "Full" box. This is all we need to do for now as, to begin with, we are more interested in getting the network up and running than in security. Click OK and the icon for the C: drive will change, to indicate it has been shared.

20. Try to browse the drive from another PC in the same workgroup. If all is OK, repeat the process with other drives and printers throughout your workgroup.

Happy networking!

I'm off to Novell's BrainShare conference in Nice, so next month I will share the juicier bits of gossip with you.

PCW Contact

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A star is born

Do you know your thin ethernet from your T connector? Your star cabling layout from your 10Base2? Mark Baynes puts networking basics in the spotlight to help you get connected.

Most letters I get are concerned with basic networking problems, so this month will be of use to most people. I will be covering the basics of networking PCs in terms of network topology and cards. As ever, this will be hands-on and based on real-life situations. Some information will already have been covered in previous columns but bear with me, because it is worthwhile to cover every step. We are only concerned here with ethernet networks, not the wonderful world of Token Ring.

So what are we trying to do? And, more importantly, why? Networking is simply a matter of connecting two or more computers together so that their resources can be shared. Whether a network is the web or two PCs in your bedroom, the principles are the same. By resources, most people mean files, but the most commonly shared resource on a network is a printer.

On the bus

The first thing you are going to need is a good network card and some cabling. For most people, their first network is a peer-to-peer affair whereby two or more computers share their files with each other. The most simple way to do this is to use 10Base2 or thin ethernet cable (also known as BNC) to establish a bus topology (i.e. network structure) as seen in Fig 1.

You will need an appropriate length of cable between each PC to be networked, and it's a good idea to buy cable lengths slightly longer than you need in case you move your PCs (but not so long that it turns into spaghetti all over the floor).

Each PC will need a network card with a BNC connector and each card will also need a T-connector. The connector attaches to the BNC port, or stub, which sticks out of the back of the network card. The BNC cable does *not* attach directly to the stub (Fig 2). T-connectors are usually included with the card.

Thin ethernet cable is easily recognisable because it will have the BNC connectors at either end: sometimes these are covered with a rubber sleeve, sometimes not, and the cable is quite stiff in comparison to twisted pair or 10BaseT cable. This is because it is shielded and is therefore more robust. Thin ethernet is not sufficiently robust that it will withstand a desk or chair leg being placed on it or a person's weight being applied to it.

Now, whether or not your BNC network cable (or cables) snake all over your office, with BNC cabling you are merely organising a single line or daisy-chain of PCs and the network cards at either end of the line have to be terminated. This is done by attaching a T-connector to the network card stub, but instead of attaching *another* piece of cable to the *other* side of the connector, you attach a terminator block (Fig 2).

It may be that at some point one of the PCs at either end of the network may need to be removed for some reason: you can remove the T-connector from the PC and just leave it dangling there, and the network will still work well as long as the terminator is present: I've done this a number of times. But it is much better to shorten the network by that single cable run and move the T-connector to the PC which is now at the end of the line.

Star spotting

If you have five or more PCs, or you plan to have more in future, you might be best advised to use a different type of cabling layout from the bus topology, the star, at the centre of which is a hub (or repeater, if you prefer the old-fashioned term). I have used both topologies and prefer the star simply because it is easier to manage. The problem with the bus approach is that the network signal goes from one PC to the next, so if there is a break in the cable in the middle of the network, PCs either side of the break cannot communicate with each other. Also, you have to faff around with T-connectors and terminators — thin ethernet cable is difficult to tuck away out of sight.

If you use the star approach (Fig 3) all

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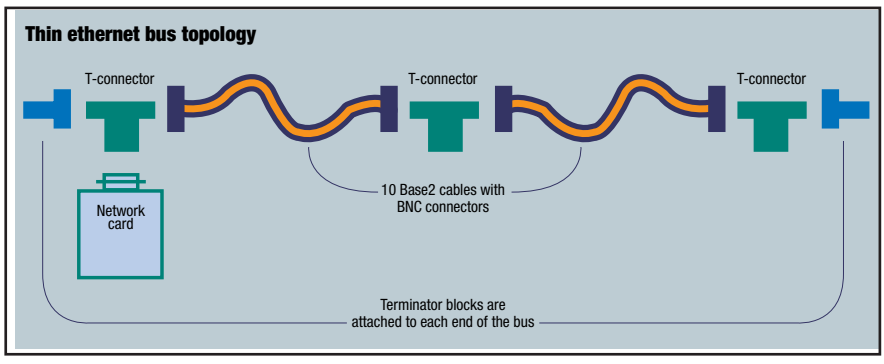

Fig 1 The thin ethernet bus topology requires terminator blocks to be attached to the T-connectors of the network cards at each end of the bus

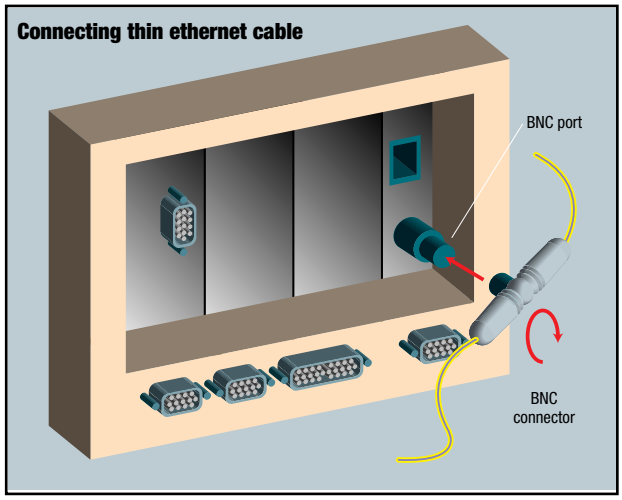

Fig 2 (left) Thin ethernet cable is always attached to the network card via the T-connector, never straight to the BNC stub on the card itself *(Source: 3Com)*

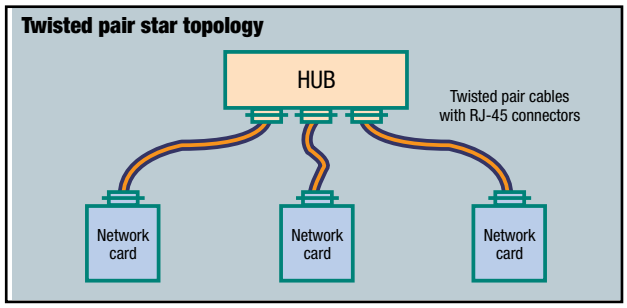

Fig 3 (below left) The twisted pair star topology means the extra expense of buying a hub but is a much better network layout to manage

PCs are connected directly to the hub, so if a length of cable is damaged, only the signal to the PC on the end of that cable run is affected: the others are still in contact with each other. There is the extra cost of the hub, but it's well worth it in the long run.

All hubs have simple connection indicator and network traffic lights on each port which can tell you whether there is a live PC at the other end of the cable run, and give a crude indication of network traffic. There are many different sizes of hub available: from mini-hubs with only four ports, to hub units with 12 or 15 ports which can be connected to other hub units, thus providing a single logical hub of 60 ports or more. For most small offices a hub with 10 or 12 ports will suffice.

Hubs can be daisy-chained together using a special crossover port. I do this in the office, with one hub downstairs with all the network PCs and the print server connected to it, which is then daisy-chained using a long run of cable to another hub upstairs, which has the server attached to it.

You can get 10Base2 hubs which use the BNC approach but most people use twisted pair or 10BaseT hubs which use what is called an RJ-45 port and connector, which looks similar to the connector on the end of a phone or modem line but which is slightly different. The RJ-45 connector on the end of the cable goes into the RJ-45 port in the network card at one end (Fig 4) and the hub at the other end, and that's it.

Twisted pair cable is also thinner than thin ethernet cable so it is easily tucked under the corner of carpets and up the stairs (you should see my house…). But this flexibility is at the expense of resilience, although it is reasonably durable. Because the nature of the star approach means that you will have lots more cable lying around, it is quite often a good idea to fix some plastic ducting to the wall and run the cables through this. You can find this type of ducting in most DIY stores and it's worth the time spent installing it.

Play your cards right

If you are not sure what sort of topology to adopt, I would suggest a combination card, so-called because it has both BNC and RJ-45 ports which allow you to install the card once and change cable types as you wish.

Some cards have an AUI (Attachment Unit Interface) port but for most small networks a combo card with BNC and RJ-45 ports will do fine. I am on record as having stated my belief that it is well worth investing in a good-quality card: 3Com has

p304 ➢

Bang on queue

Following publication of the Hands On Networks column in April's PCW, I've received several letters regarding the issue of print servers. Here's one of the best. Thanks for your input, everyone!

■ "With regard to your reply to a reader's letter about print servers which do not require a network print queue. In fact, the HP JetDirect card supports the functionality you need, in both the internal and external flavours.

"Download Windows for Workgroups drivers for the card, so that a WfWG Network PC can print directly to the printer. The driver uses MS DLC.

"You can also add HPNetwork Printers to W95 which will work in the same way. I've a group called

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HP_Network_Printers
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in my Network Neighbourhood and can map a local device directly to the device in the Network Printer group.

"If a printer can be made visible in a WfWg network, I think it can be viewed and used by OS/2, and even SCO Open Server 5.0 with Advanced File & Printer Services.

Jason Cathles
jcathles@compuserve.com

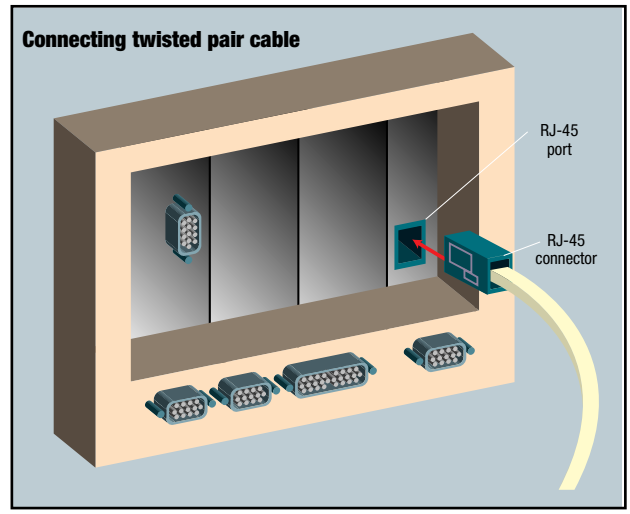

Fig 4 Connecting twisted pair cable is simply a matter of plugging the RJ-45 jack on the end of the cable straight into the socket in the card. *(Source: 3Com)*

kindly lent me some of its rather good EtherLink cards: the EtherLink III ISA combo and the EtherLink XL PCI RJ-45 card.

Upon opening the box of any good network card you should find at least three things: the card itself, a documentation booklet, and a floppy disk containing a setup program and basic drivers for the usual network clients. The only ones with which we are immediately concerned are the Windows drivers.

My installation machine is an ageing 486DX2 50MHz ISA PC with 12Mb RAM and a 500Mb hard drive, running Windows for Workgroups. It normally has an SMC card installed in it (and has done for the last three years) which has been trouble-free, but for the purposes of this month's column I have removed it.

Physical installation of the EtherLink is simple: just open the machine, slot the card into a free ISA slot, screw down the rear plate, attach the network cable to the card via the RJ-45 or BNC socket, ensure that the network cable you are attaching to the card is attached to the rest of the network, and that's it from the hardware side. But this is only because the EtherLink is software configurable. If you have a card where you have to faff around with jumper switches on the card itself, you will have to set these correctly. I always leave the PC casing open anyway, until I know the new network card is working.

It is always a good idea to check which IRQ and memory address space is free for your card, irrespective of whether your PC and card combination can automatically detect these settings. If you insist on jamming a card into every available slot in your PC, you may have some juggling to do. I always try to keep things as simple as possible in the knowledge that they will get complicated anyway.

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Suspect packages

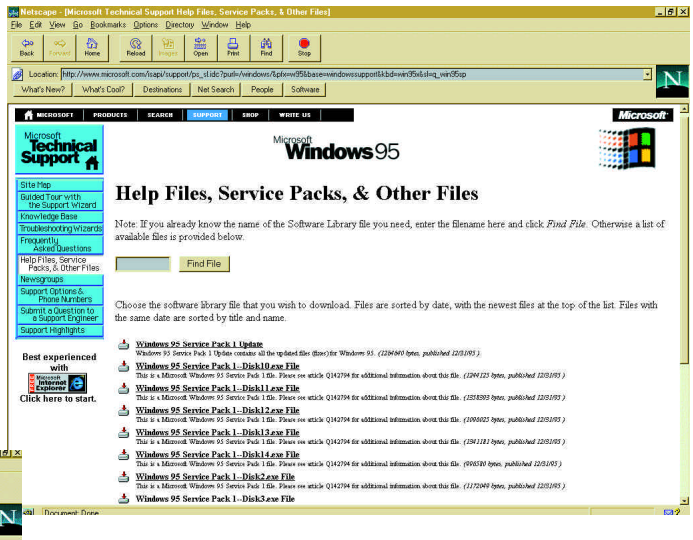
Mark Baynes learns his lesson — you must treat each new bit of software with suspicion, no matter which supplier it comes from. A simple installation could turn into a real ordeal.

My Ant Web network is in a far worse state than last month, for the simple reason that we decided to buy a scanner. "What on earth has a scanner got to do with a network?", I hear you ask. I have always considered networks to be not just cables, cards and hubs, but also the PCs, servers and associated gadgets that hang off them.

I bought a Hewlett-Packard ScanJet 4p and decided to install it on one of the clone PCs we use that are running Windows 95. I installed the HP SCSI card and the HP Deskscan and Visioneer PaperPort software that comes bundled with it. I re-booted, and the PC froze with a memory exception error. I re-installed. The PC re-froze with the same memory error. Assuming it was the PC that was the problem, I removed the SCSI card and placed it in my own PC. The same thing happened — twice. The problem is that the PC on which I first installed the scanner now crashes whenever any software is run, so I have to reconfigure it.

Right Make sure you install the Win95 Service Pack 1 update before putting Office 97 on your system

Below Check out the *Network News* web site for a comprehensive set of links to networking companies



I insist that all data is kept on the server, so it's only Win95 and the applications that need to be re-installed. I called HP tech support who advised me to remove a couple of lines, referring to the PaperPort software, from the system.ini file. When I did this, the scanner worked but nothing else, so I re-installed Windows 95 on my PC, re-installed the PaperPort software, edited the system.ini file, and then put my applications (Office, HTML editor, just the basics) back on to my machine. It worked OK.

The trouble is that this nonsense took me a whole day to sort out. My LAN was an irrelevancy, with half the PCs trashed. The reason I recount all this is that you should always treat *any* new software as being suspect until proved otherwise. An important technical note that came out of this is that if you have an original version of Windows 95, especially the upgrade from Windows 3.x, and are going to install Office 97 onto a Windows 95 PC, make sure that you install the MS Windows 95 Service Pack 1 before you install Office 97, which you will find at www.microsoft.com/windows95/. I wasted another day before I twigged what was going on.

Web sites

I am currently overwhelmed by emails from readers and I must apologise if a reply does not appear in print — there isn't enough space to print them all. One FAQ is the whereabouts of good sources of networking information on the web. I don't know of any single site worth visiting, but you could try the home page of *PCW*'s sister publication, *Network News*, at www.NetworkNews.vnu.co.uk and check out the "Links" hot spot which has a comprehensive list of networking

p288 ➢

Compaq Prosignia 200 workgroup server

I have used Compaq servers for years, and although it is a byword for reliability and performance, Compaq traditionally also means expensive, so I was more than interested to review the new Prosignia 200 workgroup server which you probably will have seen advertised in the national press as starting at under £1,000. The unit I reviewed had a 166MHz Pentium Pro, 48Mb RAM, 1.6Gb SCSI drive and Compaq NetFlex-3 ethernet card pre-installed.

At this price I fully expected the system unit to be rather tacky, but I was proved wrong. The Prosignia has a very solid feel. To get at the inside you unscrew three thumbscrews at the rear — no messing around with screwdrivers, then slide the left-hand panel off. The internal layout is, well, pretty weird. The power supply, floppy drive, CD-ROM and SCSI drive(s) sit at the top of the unit, the motherboard is on the right-hand side with the Pentium Pro halfway up the board. To the rear of the motherboard is a riser board which has two PCI, one ISA/PCI and two ISA slots, but these are almost completely hidden from view by a metal supporting plate (or "expansion backplane brace") which runs the length of the unit.

To install a card you have to disconnect the fan and pull the whole riser sub-assembly out of the unit. This is the first time in six years of configuring servers that I've had to read the manual to install a network card.

Worse was to come when I tried to put the sub-assembly back in, as it needed quite a bit of pressure and I ended up laying the server on its side before applying a final shove to slot the riser board into the motherboard. I was terrified I was going to break something. The next daft thing is that the SIMM sockets are right at the bottom of the motherboard, so if you move *this* server, do it very carefully. With the power supply and drives at the top of the unit, it is top heavy (and there are no stabilising feet). In fact, the layout of the Prosignia 200 would make much more sense if you were to turn it upside down. No doubt this strange arrangement is the only way Compaq can produce a server at such a low price.

Inside the Prosignia packing there are three packages: one, labelled Server Set-up and Management, contains Compaq's SmartStart and Insight manager software. Another, labelled Software Products, contains versions of Novell's IntranetWare, Cheyenne ARCserve for NT and NetWare, Windows NT Server v3.51 (why not v4.0?), and SCO UnixWare and Netscape Servers, all on CD and optimised for Compaq's hardware. Of course, you will only be able to use the Compaq version of the NOS after you buy the appropriate licences from Compaq, which will then allow you to access the software via a CD key. I was provided with the SmartStart key for IntranetWare so I had to install that. The final package contains basic setup information.

Within the Set-up and Management package there is a SmartStart setup sheet. Once you have the appropriate activation keys, you boot the server from the SmartStart CD. SmartStart is a good idea both in theory and practice, as it will optimise your server operating system which will make a difference to your network's performance.

I did not have the Prosignia 200 on my network for long enough to get a good idea of its reliability, but being a Compaq it should be pretty stable. Would I spend my own money on one? No, I don't think so, because I have the feeling I would break something the first time I put a new expansion card in it.

PCW Details

Price £1,805
Contact Compaq 0181 332 3000
Good Points Integrated NOS installation with SmartStart. Price. Should be reliable.
Bad Points Stupid internal design. Installing network cards is a nightmare.
Conclusion Buy one if you are sure will never need to put in a new network card.

Another perspective

"I was interested to read your advice in PCW [April] that it is impossible to run a printer directly as a network device without any PC acting as a server. I can't fault your reasoning, but I can say that we are doing exactly that on our network. We run a peer-to-peer network over 10Base-T. An HP LaserJet 4 printer is connected to the hub via an HP JetDirect card in the printer. No PC is designated to 'serve' the printer, yet every PC can print to it using drivers supplied with the JetDirect card. I have often wondered where the print queue goes. Is it that each PC holds its own queue? Printing is so quick that one rarely sees a printer icon on the task bar. We use Windows 95 but the card claims to support all the main NOSs. I hope this helps your reader."

David Marshall

companies' web sites. Another useful source of hardcore technical information are books. Two which I swear by are *Understanding Data Communications and Networks* by William A. Shay (PWS Publishing 1995, ISBN 0-534-20244-6) and *Computer Communications* by Beauchamp and Poo (ITP 1995 ISBN 1-85032-168-X).

Making a connection

Q. *"What is the cheapest way to connect the two machines specified below for (preferably complete) access to each other's resources running Win95? What software is needed, and what are the potential pitfalls and problems (e.g. can both machines access the internet from the one card or print to either printer)? For example, would a pair of MediaFORCE BNC Network cards (ISA) from Choice Peripherals (£14 each) be sufficient ?*

- *Machine 1 (four-year-old Dan for Windows) 486DX 33MHz* not *local bus or PCI, with free ISA slots, upgraded with two-speed CD-ROM, SoundBlaster, additional 1.2Gb hard drive, and now 20Mb RAM. Canon BJC-610E colour inkjet.*
- *Machine 2 (a soon-to-be-purchased Dan Ultimate) Pentium 200MHz (32Mb EDO RAM), free PCI and ISA slots, 28.8/36.6 fax modem, Iomega Zip drive, eight-speed CD-ROM, Wavetable sound card, Brother HL730 laser printer."*

John Rowlatt

A. Consider what is the most hassle-free way of networking two machines together. Because they are so fundamental an item, network cards are the cause of about 80 percent of network problems, so it is well worth paying a few extra quid and getting some good ones. I know of network managers who will buy an old clone PC yet insist on branded network cards.

Yes, in theory, a pair of MediaFORCE BNC Network cards plus a length of BNC cable would do the job, but I swear by two brands of card: SMC and 3Com. It is also worth buying what are known as Combo cards which have both BNC and 10BaseT connectors, so you can upgrade to a 10BaseT hub-based network without changing your cards. A 3Com or SMC Combo will cost you about £50 each and are well worth the money, believe me. I've suffered. If you *don't* take my advice and buy A.N.Other cards, then get ones that are at least software configurable. Once you have your cards installed, you can hang a printer off one machine and print to it from another using Win95 only. Accessing the internet is slightly more complicated because you will have to run the dreaded TCP/IP protocol, but get the basics up and running first and take it from there.

All in the game

Q. *"I want to set up a small LAN of three or four computers. They wouldn't be permanently linked as my friends would be bringing their computers round and it wouldn't be used much. I'm looking for a cheap way to network them, for a cost of £150 at most. They would really only be used for games like Quake or Duke Nuke 'em, which require quite fast connections."*

Neil Knapp *(Age 14)*

A At last, someone who wants to use a network for a real reason! Apparently, PC World superstores are now stocking the D-Link DE-905 networking starter kit which includes a small 10BaseT five-port mini-hub, two 16-bit ISA cards, two cables, documentation and software drivers for £99. D-Link will also give you free lifetime technical support. I have yet to get a networked version of Quake running on my own network, which is a pity because it's better than the standalone version.

Happy gaming!

PCW Contacts

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D-Link 0181 235 5555
PC World 0990 464464

SAPS up!

It's Spring again, the sap be risin' and it's a good time for Mark Baynes to review the SAPS modem sharing software kit for Windows, in addition to zapping your networking problems.

At long last I have managed to get the SAPS modem sharing software reviewed, as promised. This is for those among you who were wondering how to share a modem using Windows NT.

Last month, I was having *big* problems with my server, "Pig", and as I write it is languishing in the corner, not sulking but dead. This has meant quite a few problems, as we have been getting up to speed with our web work and so the use of a server was an imperative.

To get around the problem, I have simply used the most powerful workstation which is running NT Workstation 4.0 as a server, although as it is not a dedicated server, it is really peer-to-peer. However, this has proved not to be too much of a hassle as we are simply sharing files and do not use the "server" for anything else. Anyway, this is unlikely to be the case for much longer as we get more work in and we just *have* to be able to work more efficiently.

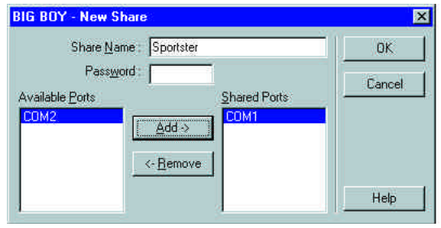
This month, I have had some letters from people who want to get to grips with the very basics of networking, and I have received several others from people asking me to stick with the problems of smaller networks. But don't worry, I will.

For those of you who are concerned about getting started with networking, I would say (a) ignore my cynicism, and (b) just get on with it. If you are running Windows 95 all you need is the networking hardware (all the essential software is included in the basic product) and this means a couple of good SMC or 3Com cards and a length of thin Ethernet cable to connect the two together.

If you take things slowly and try not to run before you can walk, then it's not too much of a problem. The main thing to consider when setting up a network card is to make sure that it works properly before you try to do anything with it. There is no point in attempting to use a network card when you know you have an interrupt problem with it. Networks are layers built upon layers and if the foundations aren't right then everything else is going to fall down: I may get a couple of cards and go through the basics of setting them up.

One of the letters I have received this month comes from Barry Phillips who has a small network running but wants to send email to his colleagues. While I was considering his question, it occurred to me that this might be a better way for me and my team to share each others' files at times, rather than simply saying "It's called snigger1.gif in AntWeb\Blue\Test\Final on Big Boy". So I may also go through the basics of setting up a Microsoft Mail PostOffice on our system in the near future and tell you how we get on.

I have most probably apologised before about spending a lot of time talking about Microsoft products like NT and so on, but the simple fact is that



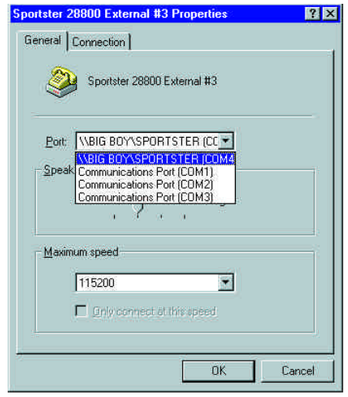
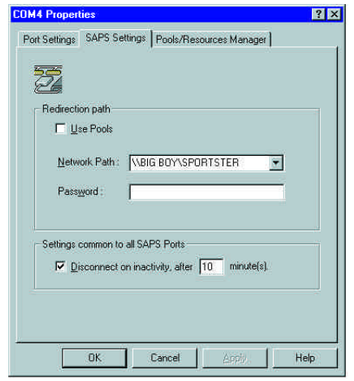


Fig 1 (top) Using SAPS Server Manager to establish a new shared Com port on NT Workstation 4.0
Fig 2 (above) Connecting to the shared modem on the SAPS server from the client workstation



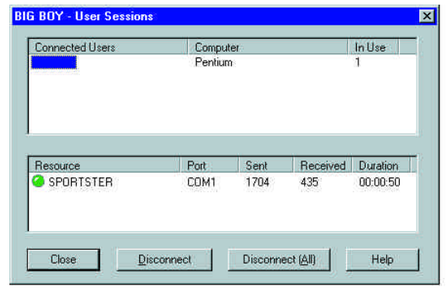


Fig 3 (below, top) The modem seen as a shared network resource from the client
Fig 4 (below, bottom) The SAPS Server Manager shows the activity of any open sessions

SAPS — SpartaCom Asynchronous Port Sharing kit

■ *The package reviewed here is the SAPS kit containing one server and five client licences.*

The way this product works is that it establishes a modem as a shared resource on the server and is accessed via the addition of a com port re-director on the clients. This version of SAPS supports either a single Windows NT or Windows 95/3.x server and five clients which can be either NT, Windows 95, Windows or DOS. SAPS supports all NetBIOS protocols such as TCP/IP, NetBEUI and IPX. I chose to install the server on a 133MHz Pentium running Windows NT Workstation 4.0 with 64Mb RAM and the client on a 100MHz Pentium running Windows 95 in 32Mb RAM, connected via thin Ethernet.

The first task was to remove the 28.8Kbps US Robotics Sportster which usually runs on the client and install this onto the NT box. Setup is simple apart from having to enter a serial number and software protection key, the only real choice being whether to install the SAPS Server and the SAPS Manager, or just the SAPS Server (I installed both).

Once this has been completed you will be presented with the main SAPS Server screen. Click on the familiar Microsoft share icon at the top of the screen and the Shares window will be displayed. Click New, then enter the new share name and an optional password. I entered Sportster and ignored the password option. I added the available Com port shown and clicked On. And that's it (see Figs 1 & 2, opposite).

The next task was to install the client. You should check to make sure that the client can see the server over the network before installing SAPS. During installation you will again have to enter a separate serial number and software protection key. You will then be asked for the redirection path that will be connected to your new SAPS port. You can set up pools of modems on an NT server to operate with SAPS (it works with NT's Remote Access Services) but as I was only sharing the one modem, I didn't bother.

Next, you must undertake a standard Windows 95 modem install, making sure that you choose auto-detect. This checked Com 1 and Com 2 and then found the modem on the newly installed Com 4. You are then ready to go, simply specifying the modem on Com 4 for any of your dial-up needs (Figs 4 & 5).

The only problems I experienced were initially naming the shared modem in the NT server setup "USR Robotics Sportster", which SAPS did not seem to like, so I changed this to "Sportster" and all was well. The other glitch was that following the autodetect on the client, which found (as it always does with my Sportster) a "standard modem", I changed this to "USR Robotics Sportster" and, despite being able to undertake a complete diagnostics test of the modem over the network from the client, I could not connect to the SAPS Server. I re-installed and this time did not change the modem detected from "Standard Modem": SAPS worked fine, and allowed me to connect to the net from my PC in the same way as if it were attached locally rather than via the network.

SAPS is a simple product, with no frills, which does exactly what it is supposed to. More software should be made this way. The documentation is simple and straightforward: it could do with a troubleshooting section, but that is my only minor criticism. I highly recommended it.

PCW Details

Price SAPS One: NT server plus five clients, as reviewed, £195. SAPS Small Office (not NT): one line plus five clients £115; two lines plus five clients £165; two lines plus ten clients £210. SAPS Server for Windows NT: £535 for 256 lines/users. (All prices ex VAT)

Contact Icon Technology 0181 357 3600. Email icon@icon-plc.co.uk. Web www.icon-plc.co.uk

Good Points Simple to install and use.

Bad Points None.

Conclusion The ideal product if you want to share a single modem in a small office with a minimum of fuss. Buy it now and save yourself a lot of hassle.

★★★★★

p308 ➢

there's a lot of Bill's software out there and it seems sensible for me to write about what you are likely to be using. And, although I occasionally use NetWare for testing, I never, ever touch OS/2 in any shape or form. Sorry.

So last month, having shared the printer using the Intel Netport Express PRO/100 Print Server and then having shared a single modem using SAPS this month, the next may well involve my setting up an internal email system using MS PostOffice and Exchange.

Or, I might just take my dead fileserver, "Pig", down to the beach and set fire to it. We like burning things in Sussex. (Ever been to the Lewes Bonfire Festival? You should go, it's great.) Or there again, I may just change my mind. On the other hand...

Booking in

Q. *"Could point me in the right direction regarding the connection of two PCs I have at home? I know I can use a Null Modem cable (and have successfully done so) but I want to try using network cards and cables. Can you suggest any FAQs or good books on the subject?*

"By the way, is it possible to connect WFWG to a machine with Win95?"

Sanjay Patel

A. A reasonable book is *Nets and Intranets with Win95* by HD Radke (ISBN 1-55755-311-4), published by Abacus. Don't worry about "Intranets" being part of the title; it is much more about basic Win95 networking fundamentals, although you might find something just as good, or better, in your local book store.

I am not too hot on FAQs and newsgroups but a bit of net surfing might reap rewards. But be warned: I have found some stuff on the net which is just plain wrong. And yes, it is possible to connect a WFWG (Windows for Workgroups) machine to a Win95 machine. I do it all the time.

Exchange and start

Q. *"I have a LAN consisting of four computers running Windows 95. We can access one another's hard drive but that's all we can do between us. Is it possible to send memos, etc, to each other? Do we need particular software to do this?"*

Barry Phillips

A. As you will already have gathered, my approach to networking is KISS (which stands for "Keep It Simple, Stupid") even though the rest of my life seems amazingly complicated, so I would suggest that if you are running Windows 95 you use the basic tools that come with it and see how they work for you. If you really find that you need something more, then start looking around.

Every copy of Windows 95 comes with Microsoft Exchange which you can use for sending email to your colleagues or for sending faxes. However, I must confess that I only use it for the latter because I find it easier and far more satisfying to shout at my colleagues and/or write things down on bits of paper (…and then promptly forget about them!). But seriously, I reckon that you will find Exchange is reasonably easy to install and use.

A simple way to check whether or not Exchange is installed on your machine(s) is to see whether the Inbox icon is on your desktop; if it isn't, then it isn't, if you see what I mean.

It may well be that when you go into Exchange, you can only see Fax services. If this is the case, you will have to go into Control Panel, Add Remove Programs, Windows Setup, Microsoft Exchange and check Microsoft Mail Services.

However, before you do all the Exchange setup, you will have to set up a Microsoft Mail PostOffice. But this is fairly simple to do: go into Control Panel again, choose Microsoft Mail PostOffice and set up a new post office. Of course, the machine with the post office on it will need to be on all the time and will have a slightly heavier load than the other PCs in your organisation, but this shouldn't cause too much of a problem.

Once you have Mail and Exchange up and working, you can set up a Memo template in Microsoft Word (I am assuming that you are using Office like 95 percent of the rest of the world) then simply send these Memos to whoever you like, using the Send or Routing Slip option that you will find on Word's File menu.

As I say, there are other mail programs on the market, but as the Microsoft one is there, why not use it?

PCW Contact

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Pigs might fly

Mark Baynes finds hardware to be a boar, as he tries to install SAPS on Pig: even putting the boot in doesn't work. He's just in time to catch the Netport Express for a quick review, though.

Ever since I took over Hands On Networks I have had problem after problem with the hardware on my network, in particular a certain server which I shall refer to as "Pig". I would like to refer to it as "*!***?* !*?*" but apparently I can't, and anyway, if my Mum read it she would be a bit upset.

You may recall, in last month's column, I mentioned that Chris Langford emailed me to ask exactly *how* I was going to share a modem on NT Server over my LAN, and I replied that I was going to review a product called SAPS which does just this thing. So there I was, software in hand, all ready to demonstrate the wonders of SAPS, when Pig failed to re-boot. It was not resting … it was dead.

Now, this is not the first time I have had problems of this kind with Pig, so I knew it was a hardware problem and gave it a good kick, and I do mean a literal *kick*, not a metaphorical one. You should never treat hardware with too much respect and should always let it know who is boss whenever you have the chance. It responded slightly to the kick but because I was up against a deadline I had to review an Intel Netport instead. This was also somewhat problematic (as recalled here).

The funny thing was, I had copied all the data files on Pig to my other server "Big Boy" only two days before, because I wanted to reconfigure it with both NT and NetWare. Lucky, huh? The reason I mention this is that if you believe your server is going to last a lifetime, dream on. Mine is from a well-known manufacturer but has been on the blink for 12 of the 24 months I have been using it. I am not revealing the name of the server because, to be fair, it does receive a lot of abuse — apart from me kicking it. But when I do get it back together, Chris, I will definitely review SAPS — honest.

So there I was, all ready to review the Intel Netport Print Server (*see page 315*). I had the hardware installed, with a test page printed. I decided to install it under Windows 95 because NT Server was down, but I found that the Netport management software, running under Windows 95, couldn't see the Netport so I couldn't configure it.

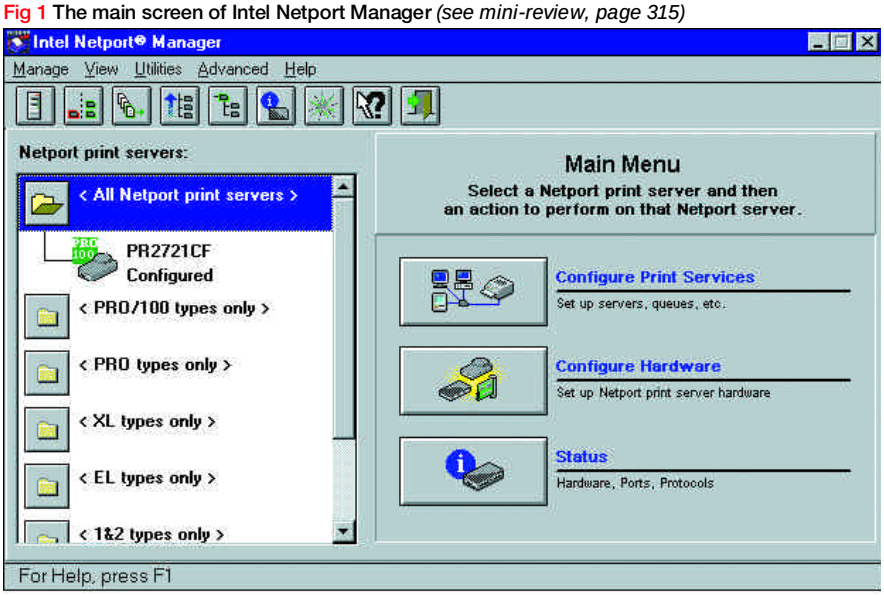
I turned it on and off several times and re-installed the software. I even read the Help file and realised that I needed NetBEUI installed. I re-booted but still got no joy, so I rang Intel tech support and spoke to two of their people for half an hour — very helpful but as baffled as I was — and then decided to attempt configuring from another workstation running Windows 95. Did this. Oops, same problem.

It seemed like a low-level protocol problem (it wasn't the physical media) and my instinct told me that the root of this problem was in Windows 95 itself, not with the Intel software. So I then installed the software onto another machine running NT Workstation 4.0: it instantly saw the Netport and allowed me to configure it.

I know I should really find out exactly what the problem was with Windows 95, but while my server may be a Pig, I also know that quite often, when networking, Windows 95 is a complete dog.

Next month: how to remove the impression of a size-ten boot from your server side panel.

Fig 1 **The main screen of Intel Netport Manager** *(see mini-review, page 315)*



p314 ➢

Mixed bag

A few words about correspondence: I am pleased to look at any queries you email me and find them very interesting, so please keep them coming. But I should point out that (a) due to lack of space I cannot print replies to them all, and (b) due to the lengthy process inherent in producing something the size of *PCW*, there is a significant delay between my receiving them and my reply appearing in this column, so don't wait for me to come up with a fix!

I will always tend towards answering the more generic questions as these are going to be of more use to more readers. And I will also favour those from individuals or those with limited backup support.

I received a query recently from someone working for a well-known IT consultant which charges hundreds of pounds a day for advice. I say to them: "Sorry, this column is for those of us who deal with little networks!"

OSI models and protocols

Q. *"It was good to see coverage of the OSI model in your column but I think you should make a distinction between the model, which applies to almost all comms protocol stacks, and the OSI protocols, which have a small user base, particularly now that the IP suite has taken over the world.*

"Your example of two developers in California and Peckham being able to co-operate using the OSI model to interface network widgets would only work if they were using OSI protocols throughout. In fact, there is so much room for interpretation that the widgets would most likely interwork only if they were following a specific OSI profile such as GOSIP. Such profiles are the closest thing to 'an OSI stack', but to use the 'OSI stack' is seriously misleading.

"On the software side, there is also no reason why developers A and B should use even remotely compatible APIs. This has been a major problem with OSI and required the invention of things like System V Release 3 Streams and other models for the software side of protocol stacks.

"The API deficiencies of OSI are another reason why IP has taken over. The latter has a straightforward sockets API rather than a plethora of higher level APIs, and allows selection of suitable presentation/session layer functionality, depending on the application.

"For example, OSF DCE RPC has a very complex presentation layer function, while Telnet's is extremely simple, each being appropriate to the application domain."

richardd@cix.compulink.co.uk

A. Richard, thanks very much for your letter and for clearing this matter up. Any more questions about protocol stacks are coming directly your way!

Halfway house

Q. *"I was interested to read in the February issue of PCW that you intend to connect four PCs together using 10-Base T and to attach further resources straight to the hub. I have a similar situation. I have a 10-Base T network of four PCs plus two printers, and I would like to achieve independence of the PCs and the printers. We run a variety of software: at various times a machine might be running any of OS/2, Windows 95, Windows NT Workstation or Windows 3.x.*

"The peer-to-peer style of networking permits each user to share resources such as printers, and to allow other workstations access. For example, workstation A has a printer and workstation B may use the printer as an output device. I do not like this example because the printer is owned by workstation A. I would like the printer to be a network device in its own right, and available to both workstations A and B. In the server style of networking the printer is owned by the server. The server is running permanently and allows workstations access to the printer.

"I want a halfway house situation where the printer is not owned by any workstation or server. I want the printer to be an independent network device in its own right. Any workstation may send work to the printer whenever it wishes.

"There are many sources of standalone box which will allow a printer to become a network device. All I have identified are intended for use with a server operating system. The printer, although connected as a network device, effectively becomes a slave of one particular server.

"Do you know of any software, or hardware/software combination, which will allow the same printer to be addressed as a network device from multiple workstations, with no server involved? I don't expect you to identify a solution for all of the software environments — any of them would be a start!"

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p316 ➢

Mini-review — Intel Netport Express PRO/100 Print Server

■ I have been trying to get my hands on one of Intel's Print Servers for quite a while now. I have reviewed a few print servers and, to be quite honest, a couple of them have been extremely poorly made. The Intel is quite the opposite, however, and is designed to withstand wear and tear.

At the front of the unit are the three printer ports, two parallel ports and one serial port, and on the left-hand side is an RJ-45 socket for a length of 10BaseT. There are a couple of recessed DIP switches, a diagnostics button and the connector for the power supply. The documentation is good, the first page of the Quick Start guide showing how to connect your printer(s) to the network.

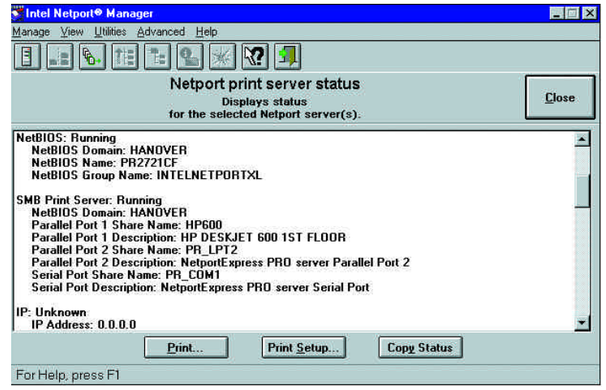


Fig 2 (right) The Netport print server status

Fig 3 (right) Basic identification details of my DeskJet 600 attached to the Netport

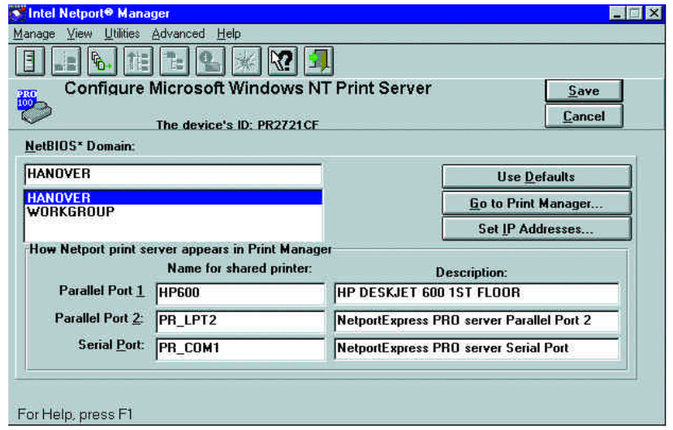
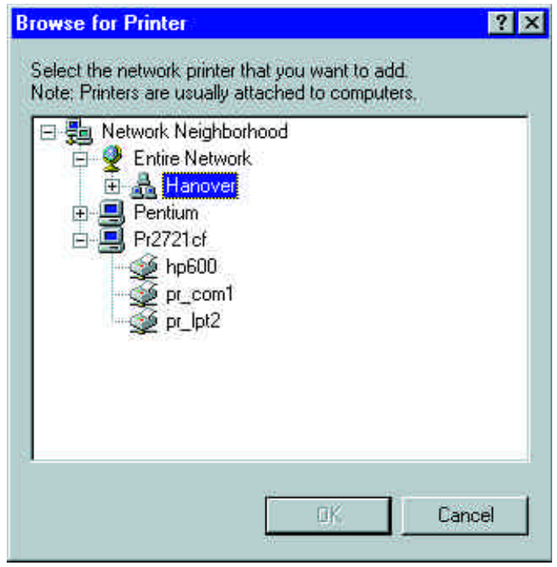


Fig 4 (below) At last! The Netport seen as Pr2721cf under Windows 95



I plugged in the Netport Express and the Activity, Transmit and Receive lights on top of the unit began to flash. I connected the existing printer cable from my tried-and-tested HP DeskJet 600 into parallel port one on the Netport Express and plugged a length of cable into the RJ-45 socket. It will auto-detect if your ethernet network is running at 10 or 100Mbits/sec. To test that all is well from a hardware point of view, you simply press the diagnostics button on the side of the Express and it should print a diagnostics report. Hardware setup time is three minutes.

I next installed the software. Network operating systems supported are Novell, NT, Windows 95, Windows for Workgroups, LAN Manager, IBM LAN Server and AppleTalk (Unix is also supported). I chose to install a 100MHz Pentium PC running Win95 and this is where my problems started — I could not get the Netport software (running under Win95) to see the Netport, but I eventually installed the software onto another PC running NT Workstation 4.0 and this went very smoothly indeed.

This is a nice, high-quality piece of hardware, but it's not cheap.

PCW Details

Price £468.82 (£399 ex VAT)
Contact Intel 01793 431155
Good Points High-quality, good management software but…
Bad Points …potential problems installing under Windows 95.
Conclusion Handy piece of kit for the small-to-medium-sized ethernet network.

p316 ➢

A. This is an interesting one! I have the feeling that what you are after does not exist, although I could be wrong.

In a peer-to-peer situation, a printer hangs off a specific PC which is, in fact, a print server for that PC dealing with the print queue. In a server-based LAN, the printer can hang off the server or, more likely, be an independent physical network device in its own right (*see mini-review of Intel Netport Print Server, page 315*) but — and it is a big "but" — the print queue has to be managed somewhere by the NOS. In a server LAN, this is going to be the NOS running on a server.

So your ideal of "a halfway house situation where the printer is not owned by any workstation or server" is not really possible because it has to be managed by something.

There goes the Neighbourhood

Q. *"I have a 486 DX4 100 running Windows 95 and a Pentium 75 with NT W/S 4.0.*

"Things ought to be going smoothly — after all, this sort of setup is Microsoft's dream, is it not? Well, unfortunately, the Windows 95 machine shows no computers in Network Neighbourhood — not even itself — even if the 'T-piece' on that machine has a terminator on both ends. The Entire Network icon exists but when attempting to open it I get the message: 'Unable to browse the network … it is not accessible'.

"The NT machine allows browsing of the network, but the other PC (the only other one on the network) does not show. I have toyed with the idea of a hardware fault, but I have tested everything I can think of and that appears not to be the case.

"I am a newcomer to networking and can't be sure all the settings on either machine are correct, but I am fairly confident. Any ideas? (The protocol I am using is TCP/IP, but I have also installed NetBEUI.)

"If I enable file/print sharing on the Win95 machine, it does appear in Network Neighbourhood although it takes a couple of minutes for this to happen, during which time it is still unable to browse the network."

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A. It is nice to know that this happens to other people apart from me! Don't worry about being a networking novice: I have been doing this stuff for over five years now and I still often find that after zapping my PC's hard drive and carrying out a reinstall (which I do on a regular basis to clear out all the dregs of software I have reviewed), I still get this problem from time to time.

I cannot tell you definitely what the problem is but try this:

1. The first thing to do when you have any network connection problems is to check the physical media — do you know for certain that the network cable works properly? Can you borrow another one on a working system for a while and try it with that?
2. Are you certain that the network cards in each machine work? If not, get their installation disks and run the self-test diagnostics. Then double-check to make sure there are no interrupt clashes; you can do this by looking in Settings/Control Panel/System.
3. Have you tried the Network troubleshooter in Windows 95 Help? This is quite good and has saved my bacon a couple of times.
4. Remove all your network software components and start again, but to start with try just running something simple like IPX or NetBEUI, before trying TCP/IP which is about as much fun to configure as putting your hand into a waste disposal unit and turning it on.
5. Have you tried Find Computer from either the Start menu or Windows Explorer? I have found in the past that although a computer will not show up in Network Neighbourhood you can "Find" it. Strange but true.
6. Zap both PCs and start again. It's a drastic measure but it often works. It depends how much software you have installed on them because some programs can, for no obvious reason, have side effects on others.

PCW Contact

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