Two's company

You don't need an entire bank of PCs to create a network. Roger Gann's no-nonsense guide shows that linking two PCs can be not only a simple task but cheap, too.

A s we race headlong towards the Millennium (no Matrox puns intended), the PC buzzword is "connectivity". To get the maximum from your investment, your PC just has to be connected to others, either via a local area network or to the internet. The *Hands On Hardware* column is nothing if not topical, so this month I'll be showing you how cheap and easy it is to network a pair of PCs, courtesy of Windows 95.

Why network? The age-old reasons are just as valid for two PCs as they are for 2,000: you can share data and expensive peripherals, you can centralise backup and improve security. Here is an example: maybe you've already got a PC at home in addition to the one you've bought your child, ready for Christmas. There's no sense in having two printers, or two tape streamers or two CD-ROMs in the house. You might as well share them on a simple network. Or, maybe you just fancy playing Quake in deathmatch mode?

This sounds like using a sledgehammer to crack a nut but it's so cheap to network a pair of PCs that it's almost a no-brainer. With less than £50 you'll be able to fully network both PCs to let them share resources. And yes, that does include VAT!

We're talking about real bargains here. And Windows 95 is the best network client you can have. It comes ready for just about any kind of connectivity you care to throw at it, together with all the networking software you may need. All you have to do is to add the hardware.

Cable capers

Mercifully, your network hardware shopping list won't be very long. All you need is a pair of network interface cards and some cable.

By far the most popular networking cable (or "media" in networking parlance) is thin Ethernet, also known as 10Base-2. This resembles a co-axial cable, the sort used in TC aerials. A five-metre long cable, terminated in BNC connectors will cost you around £10.

You will also need a pair of T-pieces and a pair of terminators, the total cost of which is about £6. Thin Ethernet uses what is termed a daisy-chain or "bus" topology, with all the devices linked by what becomes a single cable running between each PC.

If you were far-sighted you might think that twisted-pair cabling (also known as 10Base-T) was the true path to follow, rather than thin Ethernet and you'd be right.

However, because it uses a star "topology" with all the cables returning to a central hub, the cost of the hub generally makes it a non-viable proposition when linking only a pair of personal computers. But it is possible to buy what I term a "null-modem" twisted pair cable that you can use to directly connect two PCs, thereby obviating the need for a hub.

Many network interface combo cards will have both 10Base-2 and 10Base-T connectors and they will automatically sense which one you're using. But they tend to be relatively expensive and for our modest project I'm wanting to keep the costs down, so I'll go for the simplest 16-bit Ethernet card with just a 10Base-2 BNC connector, which should set you back less than £20 a kick.

A really good gauge of compatibility is whether or not it is "NE2000" compatible, so look out for this — the NE2000 was an old make of network card, which was originally sold by Novell, the mother of all PC networking.

Connecting the card

Installing a network card isn't a difficult job: no worse than, say, fitting a SCSI host adaptor. These days most network interface cards, even the cheap ones, are software-configurable, which makes life much simpler when first commissioning your network.

All network cards require hardware resources, specifically an IRQ and an I/O port address. Typically, an NE2000-compatible card will, by default, be set to use IRQ 3 and I/O port 300h. There's normally no problem with this I/O address but the default IRQ is another matter. We all know (don't we?) that IRQ 3 is already spoken for, being the preserve of COM 2. It is now possible to share IRQs on a PC but it's not a particularly good idea, so in the interests of having a quiet life I'd recommend using another, unused, IRQ instead — perhaps IRQ5 which is ear-marked for LPT 2. Or maybe IRQ 10. It really does not matter which one you choose just so long as it is free.

The fact of whether you've got an old-fashioned card festooned with jumpers, or a modern jumper-less software-configurable card determines the install sequence. If it's the former, you should use Windows 95's "Add new hardware" wizard to install the card drivers. These may come with the card, or if it really is NE2000-compatible it might rely on the standard NE2000 drivers that come with Windows 95.

At this point, using the card's default settings, the Windows 95 Device Manager will tell you whether there are going to be any hardware resource conflicts. If there are, it's a simple matter to adjust the hardware resource setting that is conflicting, to one that isn't. Note down the new settings and adjust the card's jumpers to make it match. You can then open the PC and install the card in the usual way.

If, on the other hand, you have a modern network card, the correct sequence is to install the card in the PC first and then reboot Windows 95. If your PC is blessed with a plug-and-play BIOS, the new card should be recognised and you'll be prompted for drivers and then settings. If the BIOS doesn't support plug and play, use the Add new hardware wizard to auto-detect the new card. Install the appropriate drivers when prompted and if there's a hardware resource clash, simply adjusting the values on-screen will reconfigure the card. The final step is to cable up the two PCs. Fit the T-piece onto the BNC socket on the network interface card using the "vertical" side. Plug the Ethernet cable into one side and the terminator plug into the other. Then, just repeat the operation at the other end and that's it.

Putting in the protocol

We've now got to install the network protocol we're going to use, so hunt down the Windows 95 CD-ROM and plonk it in the CD-ROM drive because we'll be needing it. Windows 95 comes with several heavy-duty network protocols but for our little peer network (so-called because the workstations are of equal status), all we really need is NetBEUI. If you use dial-up networking to access your internet access provider, you might already have TCP/IP installed. Don't worry, because you can have more than one protocol "stack" in use at a time.

Fire up Control Panel and click on the Network icon. The Configuration tab should list the network card you've just installed. Click the Add button at the bottom and add a Client (the Client for

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Troubleshooting

What if you can't browse your new network at all and can't see any of the shared resources on the other PC? Often it's much better to try and sort out a problem like this from the comfort of a DOS prompt, unencumbered by Windows 95 baggage. Windows 95 comes with elementary network diagnostics which come in handy at times like these. Open a DOS window and type NET DIAG <CR> on one machine. Select I for IPX (assuming you're using this network protocol). Type N to make this PC act as a diagnostic server, then do the same at the other machine, typing I for IPX and Y. The first machine will be broadcasting test messages which the other PC will be listening out for. If it can't hear anything, there must be a hardware problem of some sort, either with the cable or with the configuration of the card.

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MS-DOS Prompt

Auto

Microsoft(R) Windows 95
   (C)Copyright Microsoft Corp 1981-1995.

C:\WINDOWS>net diag

IPX and NetBIOS have been detected.
Press I to use IPX for diagnostics, N to use NetBIOS, or E to exit this program.

Microsoft Network Diagnostics will use IPX.
Searching for diagnostic server...

The diagnostic server has been located on the network.
Communicating with diagnostic server. This may take several seconds.
Validating reply from diagnostic server.
The diagnostic server's reply is correct.
This indicates that network information is being sent and received properly.

The command was completed successfully.

C:\WINDOWS>_
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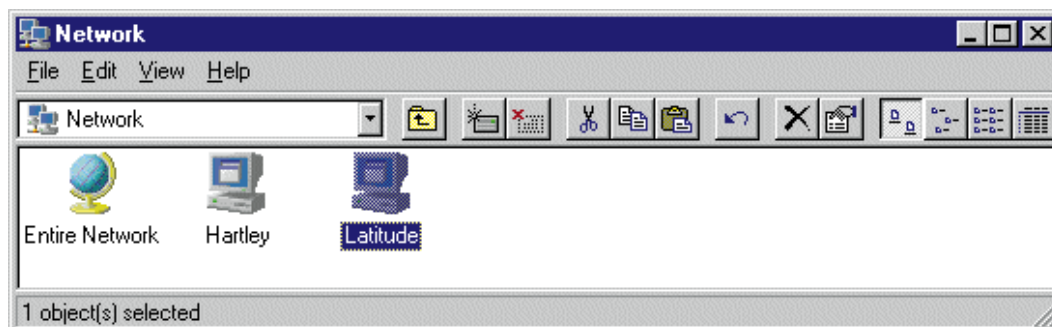
The Network Neighbourhood facility displays all machines connected to your peer-to-peer network: from here, you can configure the shared drive

Microsoft Networks). Click OK. Select Protocol and click Add. Select Microsoft from the list on the left and NetBEUI from the list on the right. Click OK. Finally click Service, select Microsoft on the left and File and Printer Sharing for Microsoft Networks on the right, then click OK.

Back at the main Network dialogue, select the Identification tab, give your computer and your workgroup (i.e. network) a name. Make sure both PCs have different individual names but the same workgroup names. Entering a description is optional.

When you accept all these settings, you'll be asked to restart the PC. When the PC reboots, you'll see a new dialogue box halfway through the Windows 95 boot sequence, prompting you for your name and password. These are "blank" at present so if you enter a name and password it'll ask you to re-enter and confirm it. Remember the password as it could come in handy later! We're now logged on to our little network. But how do we access drives and printers on the other PC?

A caring, sharing kind of network
Before we can see resources like drives and printers on other PCs, they have to be "shared". Once shared, they become available on the network. At its most simple, you right-click the drive, folder or printer icon and, from the pop-up context menu, select Sharing. Click on the Shared As button and give the resource a Share name (e.g. CD-ROM or just a letter if it's a hard disk). Select the type of access you want. For instance: full, read-only or "depends on password".

If you want, you can give a password specific to this resource. In this way you can make entire drives available either for sharing (you share the root) or just individual folders. On a network like this, I'd share entire drives and probably give full-access and read-only for CD-ROM drives.

A printer connected to the host can be shared, too. Once shared, don't forget to go over to the other PC and add the printer in Control Panel, specifying it as a network printer rather than a local printer. When Windows 95 browses the network to find

shared printers, it will discover the shared printer on your other PC. It will then install an appropriate driver, then you'll be able to use that printer as though it were directly connected to your PC.

Once you've shared your resources, you should be able to see them from the other PC. Go over to it and click on Network Neighbourhood. You should see the other PC listed next to the Entire Network icon, plus an icon for this PC. Double-click it and the shared resources will be listed (typically, a drive letter like C:). Right-click the shared object and select Map Network Drive from the pop-up context menu. Give the new drive a letter like D and check the Reconnect at logon box. When you start Windows 95, you'll be able to access the other PC's hard disk as if it were Drive D:.