



Stack 'em high

Mark Baynes' new guide to networking terms begins with an explanation of the OSI stack: it puts the 'work' in networks.

Panic over! No sooner had the HP Colorado T4000-S tape drive arrived than I ran down to the shop and bought a TR-4 Travan mini cartridge. I slammed — sorry, I mean carefully installed — the T4000-S into my dodgy server, Palace Pier, and within a few minutes was happily backing up three years' work. Actually, when I say "slam", I mean fiddle around for 20 minutes or so.

The T4000-S comes as a kit with DOS, Windows 3.1 and Win95 software (for more details on the T4000-S see my review panel, page 328) but I wanted to run and install it on Palace Pier under NT Server 3.5. The network card on Palace Pier wasn't working so there was little point in installing the T4000-S on my PC, and even if the network card in Palace Pier was working, the T4000-S is a SCSI-2 device and, firstly, my PC isn't SCSI-enabled, and secondly, I didn't have a SCSI-2 card to make it so.

I first had to go to HP Colorado's web site to download the appropriate NT drivers. Having got these, I realised that I needed to upgrade the server firmware, and having

got the necessary utility from the same site, ran it and then installed the NT driver. Next, I used the standard backup facility, which comes with 3.51, to backup all my data files to the tape. I could then begin to breathe again and set about scrubbing the server hard disk, removing the T4000-S from Palace Pier and installing it into West Pier, then restoring the files from the tape to the server's hard disks so I had two copies.

There was still the problem with the network card on Palace Pier. Because the card had given me no trouble whatsoever for the last 18 months until, that is, I started faffing about with Palace Pier, I should have reasoned that the cause of the problem was Yours Truly. But I didn't. It wasn't until I was on the phone to technical support that I realised the cause of the problem was that I had somehow managed to set the interrupt for the card to 15 — which the on-board Adaptec SCSI rightfully wanted all to itself. Setting the card interrupt to 5 duly solved the problem and I was ready to install NT Server 4.0. At some point, I had managed to set the PCI configuration to its default

setting — pretty stupid really, so please don't tell anyone.

Even though I now have a tape drive in place, I still don't have a proper backup routine. I would prefer to get the tape drive out of any one network node and hang it directly off the wire. I have the same situation with my HP DeskJet 600 which has done sterling service in the last few months, printing off five 20,000-word dissertations without a glitch. At the moment, it is directly attached to my main PC which acts as a print server, but I would prefer to use a separate print server and be able to hang it straight off the network rather than having to attach it via another device. More on this next month.

Danger — philosophers at work

I am a great believer that people who are into the technicalities of computers and networks are rather like philosophers: although they quite often use terms they do not understand, they are still capable of having meaningful conversations; and because everyone thinks that everybody else *does* know what they are talking about, they are afraid to ask the really basic questions. The problem is that some people go on for years using terms which they cannot explain.

Working on this basis, I thought I would devote some time over the next few issues to explaining some of the really basic networking terms. If you are a real expert or just a plain smart-arse, you can devote your attention to other parts of *PCW*; but if there are gaps in your knowledge, read on. I will not attempt to give complete explanations of every networking term and concept, but I will do my best to provide enough information to provide you with a basic understanding which will hopefully improve both your theory and practice of networking.

OSI Seven-Layer Protocol

One of the most common terms that is bandied about, yet poorly misunderstood, is the dreaded OSI (Open System

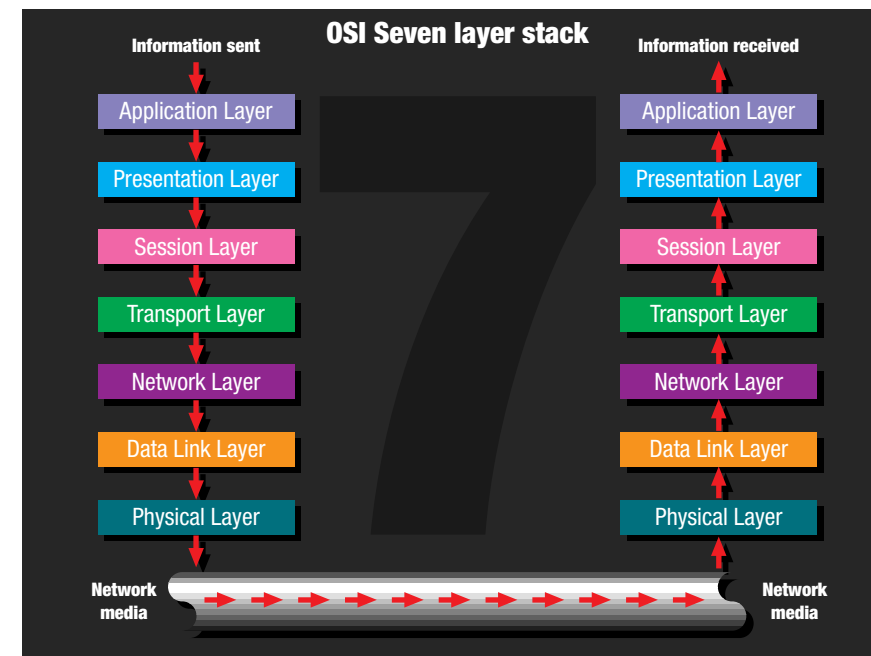


Fig 2 The OSI stack: if it didn't exist, we'd have to invent it

Interconnect) stack a.k.a. the OSI Seven-Layer Protocol defined by the ISO (International Standards Organisation). If you spend your days running and building LANs, you won't need to know a great deal about this. The simple fact is that without it, networks would not network. It is the most basic networking standard that allows one system to talk to another.

A developer, developing the latest and greatest networking widget in the sunshine state of California, knows their widget will work with the next latest and greatest networking device being built by a

developer working underneath a railway arch in Peckham because they will be designing them to work with the OSI stack.

Networking life would be much easier if every network used the same protocol but, in the networking industry, getting everyone to agree to using the same data-communications protocol would be like getting all the hardware manufacturers to agree on the same hardware architecture — impossible. The pragmatic alternative is to have a standard way of translating between different protocols and hence the OSI stack.

Standards Committees

- American National Standards Institute (ANSI): members of ANSI are manufacturers, users and other organisations with an interest in standards. They devise stuff like ASCII (American Standard Code for Information Exchange). ANSI is a member of the International Standards Organisation (ISO).
- Comité Consultatif International de Télégraphique et Téléphonique (CCITT): an agency of the ITU whose members include telecommunications agencies, scientific and industrial organisations and the ISO. Some of its most well-known and commonly-used standards are the X series which is concerned with network interfaces and public networks like X.25 and X.400, and the V series which deals with telephone communications like V.21 and V.22 modem standards and such like.
- Electronic Industries Association (EIA): members manufacture telecommunications and electronic equipment. The EIA is a member of ANSI and sets standards such as the much-loved RS-232.
- Institute of Electrical and Electronics Engineers (IEEE): usually known as the "I triple E", its members are computing and engineering professionals and it is responsible for setting standards such as the 802 series for local area networking.
- International Standards Organisation (ISO): international body whose members include other standards organisations and whose most important work in the computing and datacommunications field is on open systems, including the OSI stack.
- National Institute of Standards and Technology (NIST): a US Government agency which develops a variety of standards, including the data encryption standard (DES).

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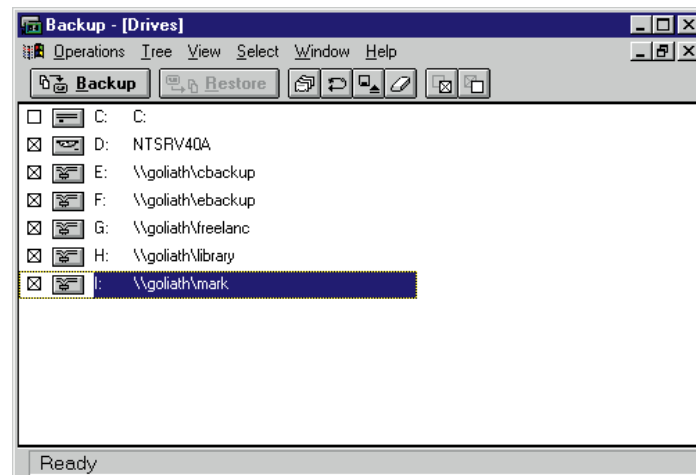


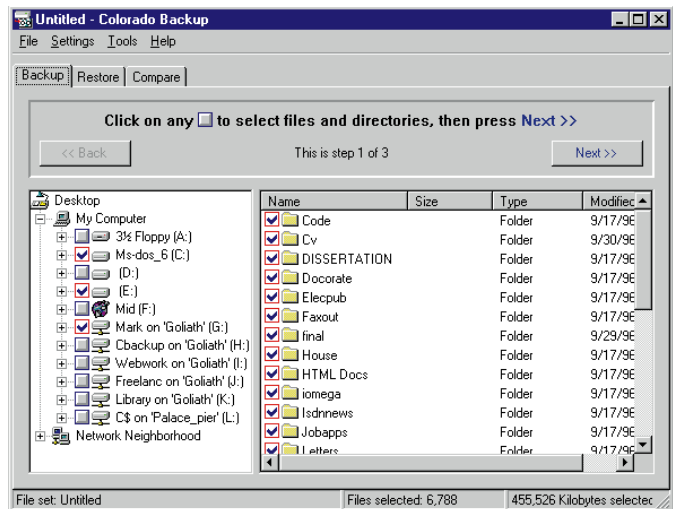
Fig 1 MS Backup is plain and simple but it does the job... just about

HP Colorado T4000-S

Colorado Memory Systems is a division of Hewlett-Packard, hence the slightly confusing product name. The T4000-S comes as part of a kit which includes the tape drive itself (standard 5.25in size), four installation screws, and two installation disks with DOS, Windows 3.1

and Win95 software. There is a 66cm long SCSI cable, software and installation guides and, according to the blurb on the box, a free tape (which mine didn't have). The default SCSI ID setting is four but if you need to change this the manual shows you how to reset the jumpers on the drive. If the tape drive needs to be flagged as unterminated, you have to remove three sets of terminating resistors from beneath the rear of the drive, for which you will need a pair of needlenose pliers, then slide it into a spare bay in your PC or server, connect the power and SCSI cables and reboot. I discovered that once I had the correct NT 3.51 drivers installed, using the vanilla NT backup software was quite straightforward. NT 4.0 recognised the drive immediately and I encountered no problems with the T4000-S during the month that I carried out backups at least once a day.

Whether you install this tape drive on a networked PC or a server you will, of course, be able to back up data from right across the network. And, having a capacity of 4Gb uncompressed and 8Gb compressed, it should be able to cope with most small LANs. There are also external, dedicated network and parallel port versions of the T4000 available.



•PCW Details

HP Colorado T4000-S

Price £321 (plus VAT)

Contact Hewlett-Packard 0990 474747

A good analogy for a data-communications protocol is a letter. Everyone knows that the agreed format for a letter is the address at the top (43 Acacia Avenue), the salutation (Dear Frank...), the main message (I want to thank you for...) followed by the signature (Yours faithfully...). This is a simple protocol, in the same way that you say "Hello" when you meet someone rather than when you are just about to leave them. Datacommunications protocols are set by standards committees (see the panel, "Standards Committees", on the previous page) who spend many a happy hour doing the boring work so our networks can talk to each other. Essentially, if the OSI stack did not exist, we would have to invent it.

Stack 'em high

Every layer in the OSI stack communicates directly only with those layers directly above and below it (Fig 2): the highest layers

dealing with user services and the lowest layer dealing with the physical nature of the transmission medium itself.

The seven layers of the OSI stack can be sub-divided into two groups, with the transport layer acting as a bridge between them. The application, presentation and session layers deal with end-to-end communications and are not bothered with the minutiae of the details of data transmission. The network, data link and physical layers at the bottom of the stack deal with the nitty-gritty of specific network communications, and the transport layer is the bridge between the two groups.

The OSI stack is a model and as such not all protocols adhere to it precisely, but it does provide a common reference model:

■ **7 Application Layer.** This is not a user application (such as Word, Notes, and so on) but it does deal directly with applications in terms of providing services such as email and file transfer.

Dear Santa...

I know you are getting on a bit now and you are very busy at this time of year, but do you remember what I wished for last Christmas? What I wanted was a cut in the cost of Basic Rate ISDN (also known as ISDN-2) installation by BT from a rip-off £400 down to something a bit more realistic so I could actually surf the net instead of doing doggie-paddle. Of course, I didn't want the cut in installation costs just for me and my friend up the road, but for the whole of mankind or anyone with a vested interest in networking in the UK. I reasoned that if the price of ISDN-2 was reasonable, loads of keen individuals and businesses would get it installed and it would really get the UK networking scene moving. Not just the business side of things but also stuff like community networks.

What did you get BT to do, you old duffer? Yeah, so they cut the prices of *some* ISDN-2 installations from £400 to £199 but then they put the cost of the rental up! What were you thinking of? I know that, at BT, those in charge of ISDN have their Christmas wish lists as well, but as I got mine in early (around February if I remember rightly) I thought I would get priority treatment. I did leave you those really nice sandwiches and that glass of sweet sherry out on Christmas Eve. By the way, sorry about leaving the fire blazing away in the grate.

So this year, I want broadband modems for every house in the land. Yep, more bandwidth than you can shake a stick at, for everyone, right into their home via their cable television set-up. If you can do this, then within a few months most families will be interacting with each other in real time and putting their holiday videos up on the web for everybody else to see. Now wouldn't that be interesting?

At the moment, the craze is for 33.6Kbits/sec modems, the trouble with this being that a 28.8Kbits/sec modem is pushing the capacity of an ordinary telephone line to the limit so buying a 33Kbits/sec version is pretty much a waste of money. However, if you ask BT nicely it will tweak your line for you. Broadband modems, on the other hand, can shove huge amounts of data around: a cable modem can do 30Mbits/sec, while ADSL (Asymmetric Digital Subscriber Line) modems using the telephone lines can do 9Mbits/sec which is still pretty quick. The trouble is, there is no point in you delivering a neat little black box to everybody on Christmas Day if the communications infrastructure isn't there to support it. But when it is, just think — neighbourhood pitted against neighbourhood in the ultimate game of Quake!



Sorts out which particular way to transport data and packet transmission.

■ **3 Network Layer.** This sorts out routing strategies. It is fundamental to the efficient working of complex topologies as it works out the best route through the system.

■ **2 Data Link Layer.** Uses error detection and correction techniques to ensure that transmissions between network nodes are error-free either by correcting the error or requesting a new transmission.

■ **1 Physical Layer.** The lowest layer needs to know the physical nature of the transmission media. For example, is this communication being transmitted over copper or fibre-optic? Sends and receives bits without comprehension of their validity and passes them up to the Data Link Layer.

Bandwidth on demand?

I have finally taken the plunge and allowed BT onto the premises to install my ISDN-2 line. Sod's Law says it looks like I will have to lift up the floorboards in the living room again to run the cable through to my study, but fortunately, the fact that I cannot afford a new carpet yet means that I will just have to shove a couple of rugs out of the way. Will ISDN-2 be worth it? Will my ISP be able to satisfy my insatiable bandwidth demands? Does anyone *care* apart from me?

■ **6 Presentation Layer.** Carries out formatting and security tasks. The presentation layer at one end of a secure file transfer would encrypt data while the presentation layer at the other end would decrypt it with the user being unaware this was happening.

■ **5 Session Layer.** Deals with starting, maintaining and stopping sessions between network nodes, especially synchronisation of sessions and error recovery.

■ **4 Transport Layer.** Lowest layer that deals with communications — the three layers below deal with the network itself.

•PCW Contacts

Mark Baynes is a web developer and IT journalist based in Brighton. He can be contacted as markb@pavilion.co.uk