Tales from the **black hole**

Our new networks man, Mark Baynes, kicks off his series by shining a bright light into the depths of network problem-solving.

If you are new to networking, do not make the mistake of thinking that looking after ten networked PCs is just the same as looking after ten standalone PCs. It isn't. It should be simpler because, with the right management tools, you can control everything from one network node; but it never seems to work like that.

Planning your network system before you implement it helps, but my experience of networks is that they tend to evolve of their own accord and network management soon turns into fire fighting, IPX driver disk in one hand, screwdriver in the other.

One of the most important pieces of advice I can give when problem-solving on networks is to always avoid the "black hole". This is a situation where in order to solve problem A, you have to solve problem B. In order to solve problem B you have to solve problem C which in turn depends on having fixed problem D. Get the picture?

At all times ask yourself why you are trying to fix something. Are you sure it needs to be done or have you disappeared down the black hole of problem solving? Have you checked for the obvious answer first? A good example of this is when you lose a network connection. Before you question the integrity of your network operating system, check the physical integrity of your network. Is everything connected to everything else and in the proper manner? Do all the cables work?

A classic example of not doing this was the first time I tried to connect four PCs to a NetWare 3.12 server using 10Base2. Whatever I tried, the server remained invisible. Network cards were installed and re-installed, IPX drivers were configured and re-configured, Windows for Workgroups settings changed, Ethernet frame types examined, lengths of 10Base2 inspected, changed and swapped around. This went on for about three days before I admitted defeat and rang the manufacturer who sent an engineer to fix the problem.

Path of least resistance

The engineer walked into the office, traced the ends of the 10Base2 cable run and examined both the terminators. He changed one and solved the problem. All the PCs could now see the server. This took about three minutes. The problem? One of the 10Base2 terminators was of 70 Ohm resistance instead of the standard 50 Ohm. The engineer had driven all the way from Birmingham to London to do this and now he was going to drive all the way back. Since then, I have always carefully checked the resistance of terminators on 10Base2 before installation.

One way around this is not to use 10Base2 Ethernet but go for 10BaseT. 10BaseT topology involves the use of a hub, but as these are cheap now, around £10 per port or less (price per port is simply the total cost of the hub divided by the number of ports), or the cost of a couple of adaptor cards, the flexibility you get from 10BaseT is worth the extra cost.

If you have to use 10Base2 for some

A personal word from Mark Baynes…

Asking me whether I would be interested in writing the Hands On Networks section of *PCW* was rather like asking a small child whether it would like to be let loose in a toy shop. "When can I start?" was my only reply. The question I found harder to answer was the one I asked myself: "What does networking mean?" A few years ago, state-of-the-art networking was running NetWare 3.12 over 10Base2 to access file and print sharing on a 386 fileserver with a whopping 12Mb RAM and a huge 60Mb hard drive. But now, networking means different things to different people. The only thing of which I am sure is that as 1997 approaches, networks of all sorts and all sizes will converge to completely change the way we live and work… well, a bit. Convergence is what it is all about.

My first introduction to networking was as an undergraduate studying computing and artificial intelligence. I would like to say that I was immediately enthralled by the power and mystery of Unix, but I hated it. Fate decreed that five years later I would find myself editor of a magazine dealing with local area networking. But I soon discovered that while standalone computers can be tricky, it's only when you try hooking them together that you can really test your technical ability. Designing and installing the VNU Labs' network testing facility proved to be as "hands on" a networking task as you could hope for. Three months ago I completed an MA in Multimedia at Sussex University which gave me the opportunity to step back and look at the concept of networking from a broader perspective. Now I find myself running a web development company, developing virtual reality systems for a variety of clients, and reviewing network hardware and software for magazines. So the issues you will be reading about in Hands On Networks in the next few months will be varied to say the least.

A BEGINNER'S GUIDE TO RAID
(Redundant Array of Inexpensive Discs)

RAID levels 1 to 5 were originally described in a paper published at Berkeley University in 1988. RAID levels 0 and 0 + 1 were added by the computer industry. There is not an optimum RAID level; you just have to consider whether you want to trade speed for security of data.

LEVEL	CHARACTERISTICS
0	**DATA STRIPING** Data is striped across multiple discs at the bit or block level which is very fast but provides no fault tolerance.
1	**DISK MIRRORING** Mirrored fault tolerance — the array of discs is split into two and one group mirrors the other. The second set of discs can be on the same host adaptor or a separate one (duplexing).
0 + 1	**DATA STRIPING ON MULTIPLE MIRRORED DRIVES** Stripes data across two mirrored banks — a combination of RAID 0 and 1.
2	**BIT INTERLEAVING/MULTIPLE CHECK DISCS** This level is not commercially available for file servers or PCs so forget about it.
3	**BIT INTERLEAVING/SINGLE CHECK DISC** Data is written across several discs at the byte level and a separate disc is used for storing parity bits.
4	**BLOCK INTERLEAVING/SINGLE CHECK DISC** Same as RAID 3 but the data is striped across all of the drives at the block level, parity information again being stored on a single check disc.
5	**BLOCK AND PARITY INTERLEAVING/NO CHECK DISCS** Both data and parity information is striped across all disks at the block level so multiple drives can fail, but data can still be retrieved.

FASTEST

MOST SECURE

RAID 0 is frequently used for non-critical servers as the server will give better performance with four 500Mb discs than one large 2Gb disc.

Another term you may hear in relation to RAID is JBOD. This stands for Just a Bunch of Discs and is what you have in a typical PC with separate drives (C:, D:, etc) where data is only written to a single drive.

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reason then buy combination cards which can take either 10Base2 or 10BaseT so it is easier to upgrade in future. The most immediate benefit to be gained from the 10BaseT star topology is that if you have a dodgy connection on a network node, only that node will be affected. With 10Base2, because of its peer-to-peer topology, if a cable is damaged, nothing can get past it. The nodes either side of the break may continue to operate but if they do, they will only be able to talk to each other.

By wiring everything into the hub, you are, of course, relying on that hub always working. But these are pretty reliable and there's nothing wrong with putting all your eggs in one basket as long as you make sure it is a damn good basket.

LAN of sorrows
On first considering writing Hands On Networks I was worried that I would not have enough hands-on network issues to write about, but within a week I had more disasters happen to my LAN than in the whole of the past year.

The first was when two drives on West Pier, one of my NT Servers, decided to give up the ghost. Fortunately, this server has a RAID (Redundant Array of Inexpensive Discs) system which I had set at RAID 5 to provide me with redundancy in case the

worst should happen. Not that it would happen to me, of course. Because data has to be written to multiple discs, RAID 5 is pretty slow at I/O, but it's safe and I had been considering reconfiguring the server to RAID 0 for maximum I/O for the previous month. I had considered getting a proper data backup policy in place. *Considering,* you notice — not actually *doing*.

One morning, the server started to make nasty sounds as if someone had given the hard drives a good scrubbing with wire wool. Maybe they had? A reboot provided me with a system message that one drive was dead and another was critical, so I needed to back up everything… and *fast*! If I had put a data backup policy in place I need not have worried. But I hadn't, so I did. The only device with enough spare capacity was my other server, Palace Pier, also running NTS 3.51, but this capacity was in the form of the NetWare 4.1 partition which I rarely use.

The ability of NT to provide a simple multiple boot setup is very handy provided you do things the right way, but I had configured this server as having a C: FAT partition consisting of 41Mb for MSDOS 5.0 with NetWare 4.1 taking up the remaining 500Mb, and a D: NTFS partition of 500Mb for NTS. Ah, I thought, just zap the NetWare partition, give that to NTS and use that to back up the other server, happily reconfiguring and formatting the "unrecognised operating system on C:" from within the NTS Disk Administrator.

NTS recognised the new space and I copied the data from the RAID server across my Ethernet network, downed the server, junked the two dodgy drives and rebuilt the remaining drives. I had to do all this in a hurry because Sod's Law decreed that this was the day I had to do some VRML work for a company in the US, within the next twelve hours. Still, I got the job done.

Several days later, my 14.4 modem started to make a continuous whining noise. As it had been playing up recently, I decided to set up one of my servers with a modem that could be shared across the network. Having bought myself a Motorola 3400 Pro 28.8 external modem from my local computer shop, I downed Palace Pier (which, you will remember, had recently had its C: partition hurriedly zapped) in preparation to installing this modem as a shared device. But then I realised I had to finish some copy which was on the server, so I rebooted.

Sorting it with the Squirrel

This was the first time I had downed Palace Pier since the hurried backup of West Pier. But on trying to reboot I was shown the message "invalid partition table" and nothing else. Seven attempts at recovering the NTS installation all failed and my NT Emergency Disc had also been corrupted. It took me a whole hour and several phone calls to my colleague Dave the Squirrel before we realised what I had done.

Normally I would realise that formatting

the C drive on a server is pretty silly, but in my rush to back up the other server I had acted without thinking.

I finally re-installed NTS 3.51 to D: and, strangely enough, I could still see and boot the NetWare installation on C:, while the NTS installation on D: was seeing C as NTFS partition E — and it still had all my data on it. Sadly, there now seemed to be a problem with the network card in Palace Pier. I could see my data was there, but I could not access it across the network.

Having to get this column out within a couple of hours, I attached the Motorola 3400 Pro to my PC and it promptly made the same whining noise as its predecessor. I then did what I should have done before I bought it. I checked the telephone line by attaching a telephone to it which promptly rang… and rang… and rang. The problem was the line, not the modem. What was I saying about avoiding black holes?

Stay tuned

My immediate problem is to access the data on Palace Pier, back it up, then re-configure Palace Pier. I will probably create even more problems for myself by going for an NT Server 4.0 install, but at least I will have something to write about.

Once Palace Pier is resurrected, I then need to get a proper data backup policy in place sooner rather than later, because although I have had some problems I have not actually lost any data — yet.

A Hewlett-Packard Colorado T4000-S

Baynes on books

■ *Internet Information Server*

The internet may be dominated by a variety of Linux and Unix servers, but Microsoft's Internet Information Server (IIS) is riding the NT wave despite Netscape's best efforts. IIS fully integrates into other Microsoft BackOffice products and its familiar user interface makes configuration reasonably painless, but its documentation is not that good.

This book tries to rectify this fault. It is aimed both at users and providers of information on the internet and is divided into six sections: creating your site, installing and developing your web site , installing and developing your FTP site, installing and developing your Gopher site, server security and site management. The first chapter is wasted on descriptions of system requirements for NT Server, being a result of the dual nature of its intended audience. Chapter 2 continues with more unnecessary descriptions (we know what File Manager is, thank you). Even as far in as Chapter 7, the basics of HTML publishing are still being described. It is only in Chapters 8 and 9 (working with scripts and ISAPI) that any useful information is revealed so you can begin to investigate the guts of IIS.

This is a good introduction to IIS but it would have been better had it assumed a greater knowledge of NT Server among its readers from the outset. It's reasonable value for a general introduction to IIS, but once you get up to speed you are likely to outgrow it very quickly.

■ *Strategic Networking: From LAN to WAN to Information Superhighways*

Networking means many things to many people. The term covers such a range of technologies and concepts that it is hard to keep up. This book should help if you want to learn more or place your own speciality in context. It is written for business executives and network practitioners. Chapter 1 begins with the basics of different types of transmission media and cabling standards, and Chapter 2 describes and clearly illustrates different topologies. Some chapters cover operating systems, network services, network design, protocols and network applications. Others cover system administration, internetworking, disaster recovery, organisational and social issues. Each chapter has a list of web references for further research.

The book doesn't attempt to treat any area in great detail but it does give a good overview of networking in the mid-nineties and will be of use to a range of personnel, especially those who want a better understanding of what the different technologies actually do.

■ *Internet Information Server* by Allen Wyatt. Price: £36.99 (478pp). Published by Prima. ISBN: 0-7615-0693-4.

■ *Strategic Networking: From LAN to WAN to Information Superhighways* by Paul David Henry and Gene De Libero. Price: £25.95 (498pp). Published by International Thomson Computer Press. ISBN: 1-85032-203-1
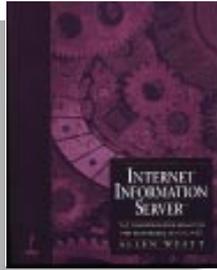
tape drive with 4Gb capacity (8Gb compressed) has just arrived so I have no excuses. Other immediate technical issues are to delve into the mysteries of routers as I have a Proteon Globetrotter sitting in my "to-do" corner, and also to decide whether I really am going to get ISDN-2 installed.

I don't mind the time I devote to sorting out my email and surfing the web but I am getting fed up with spending most evenings downloading files. I start the bigger downloads of many megabytes before I go to sleep and set Windows 95 to kill the connection after an idle time of 20 minutes so the file should be there in the morning.

However, working with a client in the US on VRML work, I find I need to send and receive large files within minutes rather than hours. Also, the client has mentioned the possibility of using video conferencing so I may have to deny all my beliefs and give BT some money now that the installation costs of ISDN-2 have fallen to £199. Pity I had to buy that new modem, really.