AUUGN

The Journal of AUUG Inc.
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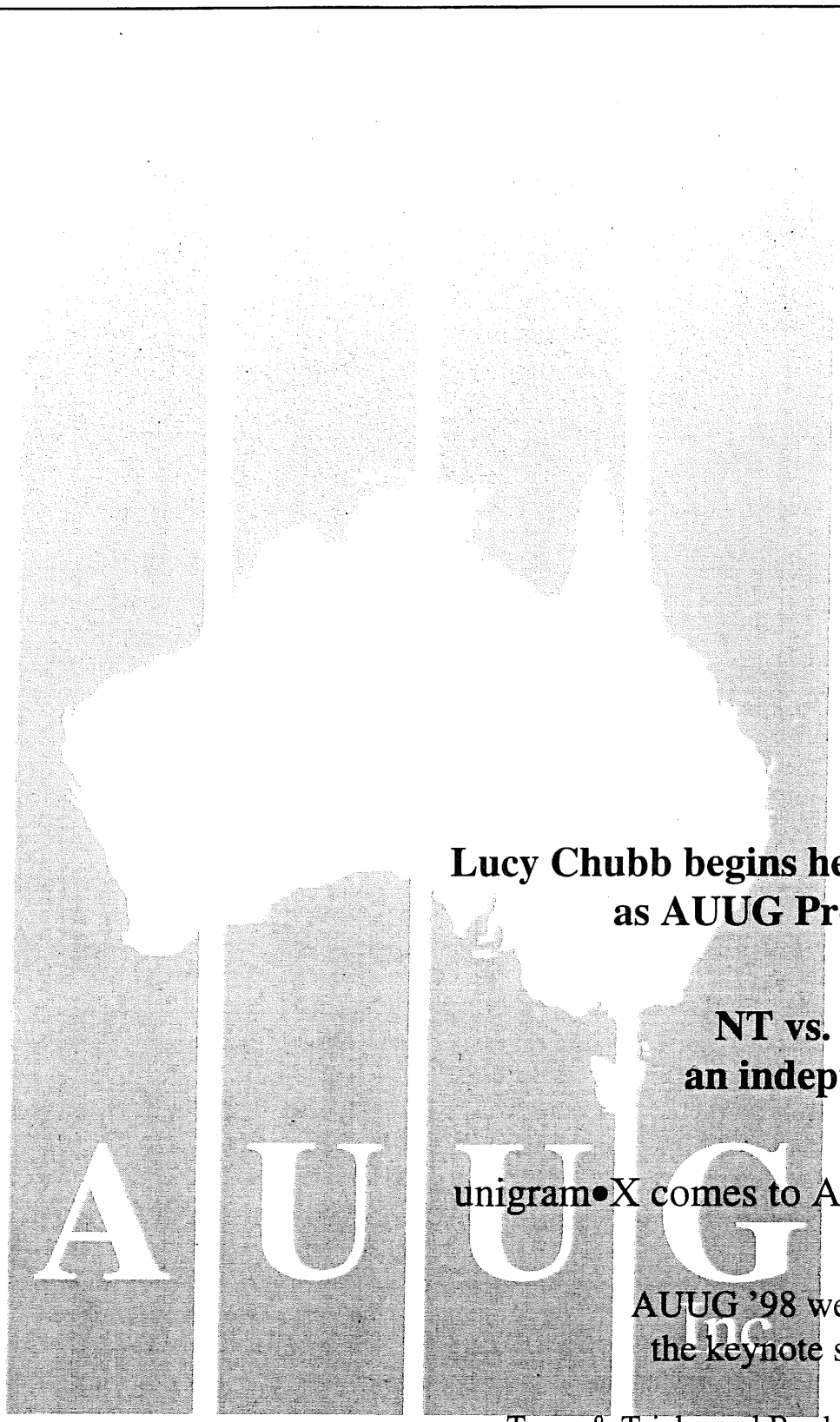
August 1998



Lucy Chubb begins her term as AUUG President

NT vs. UNIX: an indepth look

unigram•X comes to AUUGN

AUUG '98 we look at the keynote speakers

Traps & Tricks and Book Reviews

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Contribution Deadlines for AUUGN in 1998/99

Volume 19 • Number 4 • November 1998 : **October 7th 1998**

Volume 20 • Number 1 • February 1999 : **January 7th 1999**

Volume 20 • Number 2 • May 1999 : **April 7th 1999**

Volume 20 • Number 3 • August 1999 : **July 7th 1999**

Editorial

Günther Feuereisen <gunther@ibm.net>

Well, it's August in Sydney – and although today the weather is remarkably like Melbourne, and I think we can drink the water again, August is a reminder that the AUUG conference is not far away - about a month from the time you read this. You should also have received your registration forms – if you haven't, contact the AUUG office, and they'll get one out to you asap!

There has been a major change in UNIX-land since last issue:

Digital is no more – the deal with Compaq signifying the end of an era. I'm sure Compaq will continue to enhance the technologies Digital had, and were, developing, but I was a little saddened when I went to AltaVista and saw the rebadging, as well as the Compaq 'Q' on the Digital website.

Digital now passes into the realm of history, and in the future, I'm sure I'll have to explain to my Intro to UNIX students about a company called DEC and the significance their little ol' PDP-7 had on the computer world.

The other big change has been around the halls of the AUUG offices, and the new look Executive. Lucy Chubb has taken over the realms of el Présidente, along with David Purdue as VP.

Matt White takes over the role of Secretary, whilst Michael Paddon returns as a Committee member. Stephen Boucher stays on as Treasurer, along with Luigi Cantoni and the newly married Malcolm Caldwell (congrats Malcolm!).

We also have some new faces, Peter Gray from Wollongong Uni joins the Exec, along with yours truly.

Lots of things are afoot - watch this space for upcoming news ..

The conference beckons. The city is Sydney. Home of the 200 Olympics, and the biggest construction site in the Southern Hemisphere. The time is mid-September. The place, the Sydney Hilton ..

The clock is ticking - see you there!

President's Column

Lucy Chubb <Lucy.Chubb@auug.org.au>

Well, it's that time of year again. AUUG's largest event is just around the corner and the hard work of the conference and program committees is about to bear fruit. I have been going to the AUUG conference since 1987 when the conference was held at UTS in Sydney and where I gave my first paper. It is interesting to step back for a minute and look at what has happened in those intervening years.

Leafing through the proceedings for the 1987 conference I found papers on virtual memory, locking, parallel programs, optimisation, performance measurement, and networking (lots of technical material) and an abstract for a talk that looked ahead to the turn of the century. The conference was a lot smaller then; only 15 papers are listed compared with the 39 talks (plus panels) listed for this year's conference. Is bigger better? Looking at this year's conference, I see that although some of the issues have changed, the program remains a strong technical line-up with themes such as networking, security, free software, systems management, and file systems.

Michael Tilson, in his 1987 abstract, points out that from the time UNIX became available outside Bell Labs to when he gave his talk it had become a mature and widely used product. Today, with the boost given by cheap PCs and free UNIXes such as FreeBSD and Linux, UNIX has spread through homes and office desktops instead of being hidden away in computer rooms. Even when an organisation has chosen to put (another product) boxes on peoples desks, there are often one or more UNIX boxes in the background as servers or firewalls. They don't always look as pretty, but for features like reliability and flexibility they are hard to beat. Unix is out there and growing still.

Tilson predicted that the speed of change in technology would increase. He was being smart here --- just about everyone who tries to make specific predictions ends up having to eat their words. It doesn't take much experience in the industry to see the truth of this prediction. Just look at the plummeting size and soaring density of media such as disks. He observes that UNIX will open the door to distributed applications that go well beyond those of that time. Tick. Who could have predicted the explosion of activity on the internet with applications supported by it such as the web and E-commerce?

Why am I going to this year's conference? For the same reasons that I went last year, the year before, and to almost all of the conferences back to my first one in 1987. It is simply the best place to hear what's new and exciting in open systems, meet local people and key overseas speakers, and generally have a fun time swapping battle stories over a drink or a meal.

Meanwhile, life doesn't stop just because the conference is coming. As Unix needs to keep changing to make the best of a rapidly changing environment, so AUUG needs to keep examining what it's doing so that it continues to provide relevant and quality benefits for its members. As part of this, we have been looking at how AUUG can work together with other groups and organisations with similar interests. For example, it is with pleasure that I see an ISOC-AU session within our conference program for the second year running. Further initiatives are in the pipeline, and I hope to be able to speak about them soon.

On taking up the position of president, I am looking forward to the challenge of leading AUUG into the future. One of the great things about our industry is that you can never tell what new things are going to come out of it, but whatever they are, there is going to be a lot to get excited about. So it is with AUUG, there are lots of exciting things that we can do, we just need to make them happen.

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Upcoming USENIX Events

August 31-September 3, 1998, Boston, Massachusetts
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Includes highly interactive sessions on Public Key Infrastructures Six tutorials: *two by Schneier on Cryptography *Smart Cards *Electronic Commerce Law *Secure Web Server *E-Payment Systems

If you need more information, send email to conference@usenix.org or call the Conference Office at 714-588-8649. The website is:

http://www.usenix.org/events/

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A letter from the Secretary

Dear AUUG Member,

NOTICE OF ANNUAL GENERAL MEETING

The 1998 AUUG Incorporated AGM will be held in conjunction with the AUUG98 Conference and Exhibition.

The AGM will be held at:

AUUG '98
Sydney Hilton
259 Pitt Street
SYDNEY NSW 2000 AUSTRALIA

The meeting will start at 5:10pm on Thursday, 17th September 1998. All AUUG members are invited to attend. Although not required to gain entry, it would be appreciated if you could bring your membership card or membership receipt.

AGENDA

1. Apologies
2. Minutes of the previous meeting
3. Returning Officer's report
4. President's report
5. Secretary's report
6. Treasurer's report
7. Ratify appointments of Management Committee members
8. Ratify appointment of Assistant Returning Officer
9. 1999 Chapter Technical Conferences
10. AUUG99
11. Any other business.

Sincerely,

Mark White
Secretary
AUUG Incorporated

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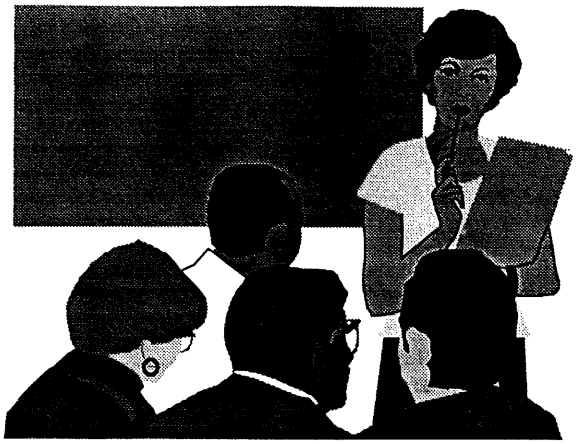

AUUG '98 Keynote Speakers

The conference is only one month away! Here is a highlight of the keynote speakers who will be attending this year's conference ..

CAMERON FERSTAT

Cameron Ferstat, is the architect and Web Master for the site, which set a record of 110,414 hits in a single minute and ranon IBM's RS/6000 SP. He will discuss the challenges that faced the IBM Nagano Website team and provide some insights into planning for the massive Web Site required to support the Sydney Olympics in the Year 2000.

ROBERT HART

Robert Hart, is Manager, Support Services, Red Hat Software Inc (Research Triangle Park, North Carolina, USA).

Educated as an aeronautical engineer in the UK, Robert worked in thermo-fluids research at Monash University, Melbourne Australia before moving to outback Australia (the Pilbara WA) first as an academic and then as IT Manager. In 1994, Robert started using Linux, first personally and then as a server solution. In 1996 Robert started his own consulting company providing Linux based solutions in Melbourne and moved to the USA to work at Red Hat in February 1998 as part of their senior management team. Robert is also the author of parts of the Linux Documentation Project.

RAMIN MARZBANI

Ramin Marzbani, is the Principal and founder of www.consult, Australia's leading Internet and E-Commerce research and consulting company. Prior to establishing www.consult in July 1995, Ramin worked with Internet startup I/PRO in San Francisco. Ramin had previously worked for Booz-Allen as well as IBM for 10 years, and has an MBA from the AGSM and a BE from the University of NSW.

RICHARD STALLMAN

Richard Stallman is the founder of the GNU project, launched in 1984 to develop the free operating system GNU (an acronym for "GNU's Not Unix"), and thereby give computer users the freedom that most of them have lost. GNU is free software: everyone is free to copy it and redistribute it, as well as to make changes either large or small.

Today, Linux-based variants of the GNU system, based on the kernel Linux developed by Linus Torvalds, are in widespread use. There are estimated to be over 10 million users of GNU/Linux systems today.

Richard Stallman is the principal author of the GNU C Compiler, a portable optimising compiler that was designed to support diverse architectures and multiple languages. The compiler now supports over 30 different architectures and 7 programming languages.

Stallman also wrote the GNU symbolic debugger (GDB), GNU Emacs, and various other GNU programs.

Stallman received the Grace Hopper Award from the Association for Computing Machinery for 1991 for his development of the first Emacs editor in the 1970s. In 1990 he was awarded a MacArthur Foundation Fellowship, and in 1996 an honorary doctorate from the Royal Institute of Technology in Sweden. In 1998 he received the Electronic Frontier Foundation's Pioneer Award along with Linus Torvalds

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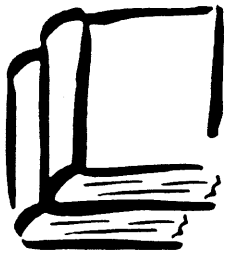
For the latest news on AUUG '98

Check out the AUUG website at:

www.auug.org.au



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From the pages of unigram·x

Editor's Note: In this issue, we bring you the first of an ongoing series of columns, providing AUUGN readers with selected articles from the weekly e-zine unigram•X.

Our special thanks to Derek Zil'ch and the people at Computerwire. For more information, see the unigram•X website at:

http://www.computerwire.com/unigramx

8 JUNE – 12 JUNE 1998

WILL LINUX GET OFFICIAL UNIX98 BRAND FROM OPEN GROUP?

The Open Group says it's been having "frank, informal negotiations" with leading open source advocates regarding the conformance of the Linux operating system to the Group's recently announced Unix 98 specifications (UX No 692). Discussions apparently began at the Uniforum Association's 1998 Spring Conference in Ocean City, Maryland recently. Eric Raymond asked the Open Group's director of branding, Graham Bird, what it would take to have Linux conform to Unix 98. Bird said the Group "very much wants to see Linux get the Unix 98 brand." Raymond is a Linux advocate whose paper "The Cathedral and the Bazaar" was said to have helped spur Netscape Communications Corp into opening up the source code of its Communicator product line to developers earlier this year. Due to the increasing penetration of Linux into the low-end of the Unix market, it would be in the interests of other Unix vendors to see Linux conform to the standard, making it easier to port commercial applications between the two and providing a more attractive installed base for applications developers to target. But there are hurdles. Unix 98 branding requires extensive testing, and the Open Group charges licensing and royalty fees for the brand - something unlikely to appeal to the community of volunteer developers who maintain and update the freely available Linux system. Linux has no vendor owner, and although a number of companies package and commercialise Linux, none are large enough to shoulder the fees required. Linux OS is not even technically a Unix operating system, and is usually described as "A Unix-like operating system". But with its low-end base dwindling in the face of Windows NT, the increasingly popular Linix could represent something of a lifeline for the Open Group and the Unix community. And the Group is indicating that it might be flexible with its rules in this case. "It's going to take some creativity to pull this off," it said in a statement. Dialog is apparently continuing.

15 JUNE – 19 JUNE 1998

HP DEBUTS 64-BIT DESKTOP UNIX, OFFERS SGI TRADE-INS

Hewlett-Packard Co will, as we go to press, announce the first desktop deployment of its 64-bit HP-UX 11.0. It has been available on the company's K, T, V and EPS servers for a few months and the company is claiming that this is the first availability, although it will not actually ship on the company's Visualise workstations until August of this year, which is roughly when HP-UX 11.0 was supposed to arrive on the desktop. The Visualise workstations are being aimed at the electronic design automation (EDA) market, where HP will go head-to-head with Sun Microsystems Inc. HP's other main workstation rival, Silicon Graphics Inc is the focus of the other part of the company's announcement. HP is piling on trade-in deals for Silicon Graphics machines on top of the price cuts it made on its Visualise workstation running fx graphics in April.

22 JUNE – 26 JUNE 1998

MICROSOFT MAKES WINDOWS NT MULTI-USER AT LAST

Microsoft Corp finally announced its Windows Terminal Server product last week, ending a year of uncertainty for the clutch of third party companies whose business had been to add multi-user capabilities to Windows NT. Previously known under the name of Hydra and first detailed back in May last year, Windows NT Server 4.0 Terminal Server Edition is an extension to NT 4.0 intended to give users of terminals and older PCs access to Windows applications without the need to use a full specification PC. For years before, Microsoft had been considering adding multi-user support to NT in a bid to remove one of Unix's key differentiators. It's a thin client schema whereby applications run on the server and are remotely displayed on the client. The software provides the ability to host multiple simultaneous client sessions on NT Server 4.0. By NT 5.0 the code is expected to have been integrated tightly within the operating system itself. Microsoft eventually included Citrix Systems Inc, the company whose business was most threatened by Hydra, in with the development credits of the product, calling it a joint development effort between the two. Citrix simultaneously launched its MetaFrame thin client software last week, which adds support for non-Windows clients to Terminal Server along with additional management capabilities, and uses the Citrix ICA communications protocol rather than Microsoft's own RDP Remote Desktop Protocol, once known as T.Share. For the time being, at least, Microsoft seems willing enough for Citrix to handle all the non-Windows side of the business. Microsoft rallied the usual chorus of approval from a huge list of OEMs, software developers and customers. But the pricing of the product was causing some uneasiness at PC Expo yesterday. Unused to the

multi-user model, Microsoft is asking Windows Workstation 4.0 licenses priced at $269 for each client, plus an additional $1,129 for the server side of the software. Existing Citrix WinFrame users have until the end of November to upgrade to the new software at a special all-in price of $2,600 for a 15 user system.

SUN TEAMS WITH NTT SOFTWARE IN SOLARIS-ON-INTEL DEAL

Sun Microsystems Inc will announce today a partnership with Japan's NTT Software Corp, a wholly-owned subsidiary of Nippon Telegraph & Telephone Corp, in a deal to resell Solaris on Intel and other products as well as porting NTT's WebBase online transaction processing tool to the Unix platform. The worldwide agreement is for NTT Software to resell, support and integrate Solaris running on Intel Corp-based systems primarily into the telecommunications market, as well as to resell and integrate other Sun products, such as Solstice Enterprise Manager network management and Sun WorkShop development tools. Sun has a different model for Solaris on Sparc-based systems. As a result of the deal, NTT will release a Solaris version of its WebBase HTTP server with a built-in OLTP monitor that enable database access from the internet some time during the next quarter. NTT claims more than 600 deployed WebBase servers in Japan already. Sun says it offers NTT a more prominent position in the US and Europe, while NTT gives Sun more credibility in Japan. At present, NTT has a few small offices in the US and has only just begun to sell WebBase in the US: its main customer being digital imaging company Live Picture Inc, in which Kodak and Sun have both recently taken stakes. In addition to telecommunications, the two companies will also work on the financial services, education and government markets.

SILICON GRAPHICS FOLLOWS HP WITH 64-BIT UNIX LAUNCH

Silicon Graphics Inc trailed Hewlett Packard Co's 64-bit Unix announcement with the launch of the final version of its own "fifth generation" 64-bit Unix, Irix 6.5 operating system. Cellular Irix, which has been in beta testing since the beginning of this year, includes support for SGI's CC-NUMA architecture, I/O bandwidth said to give it the ability to scale up to 128 processors, the XFS 64-bit file system and more systems management capabilities through the integration of technology from Computer Associates International Inc, Enlighten Software Inc and HP. There are two packages: Irix 6.5 Advanced Server environment for Origin and Challenger servers; and Advanced Workstation Environment for the O2, Octane, Onyx, Indy and Indigo workstation.

29 JUNE – 3 JULY 1998

HP AGREES WITH ANALYSTS OVER UNIX FUTURE

Hewlett-Packard Co agrees with recent observations by industry analysts such as IDC which expect Unix systems to become the next class of mainframes. It's a great opportunity for IBM Corp to repeat the business model it's been operating for the last 20-odd years, though it means Big Blue is hardly bringing any new vision to the picture HP says.

LINUX PLANS ITS OWN VERSION OF WINDOWS 98

Silicon Valley Linux User's Group is planning to launch its own version of the Windows 98 operating system - in the form of a rocket that will light up the midnight sky over California. To coincide with Microsoft Corp's official worldwide launch of Windows 98, the Linux rocket has found a vital way to use the lumbering system to get it airborne. Two CDs of the beta version of Windows 98 were cut in half to provide the four fins for the rocket. "If it does crash, just like Windoze, it will be unintentional," said the group on its website.

6 JULY – 10 JULY 1998

NT WILL PASS UNIX AND NETWARE BASE BY 2000 SAYS REPORT

International Data Corp's Server Operating Environments: 1988 Worldwide Markets and Trends, which sets out a five year forecast for sales of all the major server operating environments, found that Microsoft NT Server and Unix both continued strong growth in 1997, while Novell NetWare dipped and OS/2 declined. Sales of NT server software licenses grew 73% in 1997, compared with 17% growth for Unix, but over half of those sales were for file/print server use, a sector that only 10% of new Unix servers were sold into. NetWare shipments outpaced Unix, but declined 7%, while OS/2 declined 36%. IDC sees the trend of volume deployment for NT and NetWare and large scale value deployments of Unix servers as continuing over the next few years. NT's worldwide server base will surpass that of Unix in 1999, and NetWare by 2000. The report also includes information on VMS, OS/400, and, for the first time, Linux.

RED HAT LINUX 5.1 RELEASED ON SPARC

Linux distributor Red Hat Software Inc has released the SPARC version of its Red Hat Linux version 5.1. This is the first version of Linux for SPARC machines to incorporate the new glibc libraries. Red Hat Linux 5.0 was built against glibc, but did not support SPARC. Red Hat says the platform was "sorely missed", which seems accurate enough. Developers have been posting to Usenet newsgroups asking for the upgrade for weeks. Version 5.1 for SPARC lets users choose between various languages during installation, and supplies back buttons so users can correct mistakes during the process. LinuxConf, a

system configuration tool, has been included. Red Hat Linux 5.1 for SPARC comes with two CDs and an instruction manual.

SUN BRINGS DOS & WIN 3.1 MACHINES INTO JAVA AGE

Sun Microsystems Inc has finally shipped its JavaPC Engine 1.0, a piece of software that turns personal computers running MS-DOS and 16-bit Windows into Java-compliant machines. It is meant for software OEMs and large corporations running lots of older PCs. Sun hopes corporations will take it to Java-enable newer PCs as well and claims one OEM has already placed an order for 4,000 units of the $100 software. It enables the deployment of applications compliant with the latest complete version of Java, the Java Development Kit (JDK) 1.1. This version, however does not include any internet access capabilities, but Sun plans that for the second version later this year, which will also add a better user interface. This work has been a long time coming. Back in February last year Sun announced it was writing a version of its much-maligned JavaOS operating systems for MS-DOS machines, but that never materialised, and this particular product was being demonstrated a year ago.

SIGHTINGS OF FABLED LINUX APPS REPORTED

Among those commenting on the rise and rise of Linux, it has become a truism to point out the lack of applications available on the free operating system as an impediment to continued growth. In the web magazine Salon this week, writer Andrew Leonard pointed out that Linux has no Quicken and no Eudora. However, that caveat may not hold water much longer. Some branded applications may still be hesitating on the brink of Linux ports, but others, including Netscape and Corel with its office suite, have already taken the plunge. Add to those the lower-profile companies that have beavered away in the Unix world for years and there is no longer any shortage of office and productivity software available to Linux users. Applied Information Systems is a good example of a Unix developer recently converted to the gospel of Linux. Also this week, AIS announced availability of its XESSLite 4 Spreadsheet for the Linux desktop, with licenses priced at $50 ($80 with printed manuals). But this is the cherry on top of the company's existing commitment to the platform. XESSLite is based on XESS 4.0, which has been available on Linux for four years. Even the stripped- down version has nothing to be ashamed of where features are concerned. It supports 3D workbooks and multibyte languages, can be used as a helper application for Netscape's Navigator browser and offers a reasonably high level of interoperability with Microsoft's Excel 4.0 and 95 and Lotus 1-2-3. How many new Linux seats does AIS hope to win with XESSLite? "We don't know, in all honesty," says president Arthur Coston. At the moment the company's Linux user base is not especially significant. AIS supports ten other Unix flavours as well as VMS on Vax and Alpha and NT on Alpha and Intel. But Coston says Linux is in transition. "The people who are for Linux are pretty fervent," he observes. "They've done quite a good job on the basic OS." Now, he says, the Linux Expo has grown from a few hundred local attendees to a few thousand. Eight per cent of business cards AIS gleaned from the most recent Expo were from international inquirers. "It's a larger, more established commercial marketplace, not just the enthusiasts and students," he says. That's great news for AIS, whose other clients for its industrial-strength spreadsheet include power giant Asea Brown Boveri. Nor is AIS the only company to find opportunities in the newfound respectability of Linux apps. Market leader Red Hat Software, which sells a version or 'distribution' of Linux, will be packaging a Linux Apps CD-ROM with Red Hat 5.1. The company promises internet tools, office products, computer-aided design and sales automation software. In his critique of Linux, Andrew Leonard argues that corporate America doesn't like the multiplicity of choice Linux offers - a startling observation about a nation that has already embraced competition in telephony and electricity. But it's true that when it comes to desktop applications, Linux users will soon be spoiled for choice.

SMALL FLAW IN SSL, NOT MANY THREATENED

A researcher at Lucent Bell Labs has discovered a flaw in the Secure Sockets Layer technology which underlies many electronic commerce platforms and sites. But the flaw is almost impossible to exploit undetected, and it seems never to have been used in anger. Daniel Bleichenbacher of Secure Systems Research was working on a proprietary protocol for Lucent when he discovered that the error messages returned in an attack leaked small amounts of information about a given encrypted session. He wondered whether other, commercially used protocols might be vulnerable to the same attack. Upon investigation he found that indeed, SSL was vulnerable. To attack an unprotected SSL server, a hacker could send thousands of messages. Using the Public Key Cryptography System Number One (PKCS #1) as its key establishment protocol, SSL rejects all the messages that do not conform to the correct session format, but it accepts the few that do. By tracking which messages are accepted and which are rejected, a hacker could piece together the key for an encrypted session. However the attack is far from unobtrusive. On average, one million messages are required before the key can be deduced. That level of traffic is easy for a site administrator to spot. In addition, as Bleichenbacher points out: "Most messages trigger an error, and most error messages are logged by SSL servers." If someone had ever attempted to hack an e-commerce site this way, they would almost certainly have been caught. Finally, for the attack to work the hacker must already have gained access to the client or server system. Taken together, those limitations make it pretty unlikely that anyone could ever exploit this flaw. "It's not that serious [a problem]," Bleichenbacher concludes.

"SSL is a pretty good protocol." RSA Data Security, which originally defined PKCS #1, says it is working on countermeasures with a broad spectrum of web server vendors, from C2Net and Open Market to Netscape, Microsoft, IBM and Lotus. RSA adds that while SET and S/MIME also depend on PKCS #1, mechanisms already implemented in those protocols make them invulnerable to this particular attack.

13 JULY – 17 JULY 1998

COMPAQ READIES NEW UNIX NAME AND MORE PARTNERS

Compaq Computer Corp says it is currently getting final trademark approval on the name it has chosen for its next-generation Unix on Alpha RISC and IA-64 that will supersede Digital Unix. Compaq says it will also name new partners for the development project, which as we first reported is code-named Bravo. Compaq's Tandem unit and Sequent Computer Systems Inc are already Bravo card-carriers. Compaq has also been talking to Santa Cruz Operation Inc about which APIs to swap to facilitate compatibility between Bravo and SCO's Intel-based UnixWare operating system. Meantime, it says one of its executives was "talking out of turn" and says its AllConnect program is designed for NT-to-Unix integration and interoperability, not migration.

RED HAT, CALDERA DEFINITELY, ABSOLUTELY NOT MERGING

A Red Hat Software Inc spokesperson called last week to confirm that the company is not negotiating a merger with fellow Linux distributor Caldera Inc. That will disappoint free software community members who have been debating the pros and cons of such a deal all week. One posting to a mailing list deemed the rumour: "Unlikely. A short trip to LinuxExpo shows just how narrow the tightrope is that Red Hat walks. If they venture too far to the commercial side they risk alienating their core programming team (ie, the t- shirted, blue-jean-clad hackers at LinuxExpo). If they venture too far to the hacker side, they risk losing their commercial clients." But another poster retorted: "Frankly, I think the only group that would benefit from the merger would be Caldera." Unlike Red Hat, this poster argues, Caldera has a low profile in the Linux community and in the Unix community as a whole.

DIGITAL TO OFFER LINUX-READY ALPHA?

Rumour has it that the open source operating system Linux will soon enjoy support from a significant commercial vendor. An anonymous poster to Slashdot.org ("Leaky", posting from "faucet.mail.dec.com") suggests that Digital is about to announce a "Linux-ready" version of its Alpha workstation. The single- processor box is supposed to be aimed at the education market, with details apparently due later this week. The leak met a cautiously positive reception on Slashdot. Many questioned the credentials of the poster but others praised the Alpha architecture. Linux had a big win on Alpha when a team from Los Alamos National Labs built the world's 315th fastest supercomputer in a weekend. The team achieved 19.2 Gigaflops per second with 'Avalon', a network of 68 Alphas running Linux. Avalon's performance rivals that of a $1.8m SGI Origin 2000, according to lead designer Michael Warren, but the team assembled the computer for $150,000.

SUN & LOTUS TO UNVEIL JAVASTATION ESUITE PORT

Sun Microsystems Inc and IBM Corp's Lotus division will use this week's Internet World Summer in Chicago to show off the new version of Lotus' eSuite running on Sun's JavaStation network computers. The eSuite package of Java applications, which includes a word processor, spread sheets, graphics and email, is currently only available on IBM's Network Stations NCs. The JavaStation version will ship July 21. As this is Java, the porting job was not too taxing - Lotus says "porting is probably overstating it" - but there are a few subtle differences between the Java virtual machines on the different hardware platforms, the company says. The eventual JavaOS for business collaboration between Sun and IBM should sort that out once and for all. In a joint promotion, new buyers of Sun's Netra j servers will get eSuite free for 120 days to try on their JavaStations. After that it will be $49 per seat as opposed to $79 if they forgo the trial period. In September Lotus will take the eSuite to 1.5, adding a port to PCs, supporting the JVMs from both Netscape and Microsoft, says Lotus. It will also add the ability to exchange files between Lotus SmartSuite and Microsoft Office applications and eSuite applets, and last, but not least, such seemingly crucial things as a spell checker and an undo facility will finally be added to eSuite.

GATES CONSIDERS RETIREMENT IN FIVE YEARS

Microsoft Corp chairman and the world's richest man Bill Gates is starting to think about retiring after heart-to-heart talks with financier Warren Buffet, the second wealthiest person in the US. According to a report in the Times, he is giving a lot of thought to the person he will hand over to but reckons it will be five years before he has to do something about it. Gates and 68 year-old Buffett have become good pals and discuss what to do with their fortunes over endless games of bridge. Given that he is just 42, the fact that Gates is considering retirement suggests that he is getting a little jaded, worn down possibly by increasing brushes with regulatory authorities. Those who know him suggest that Gates will never be able to walk away from Microsoft and forget entirely about the company he founded.

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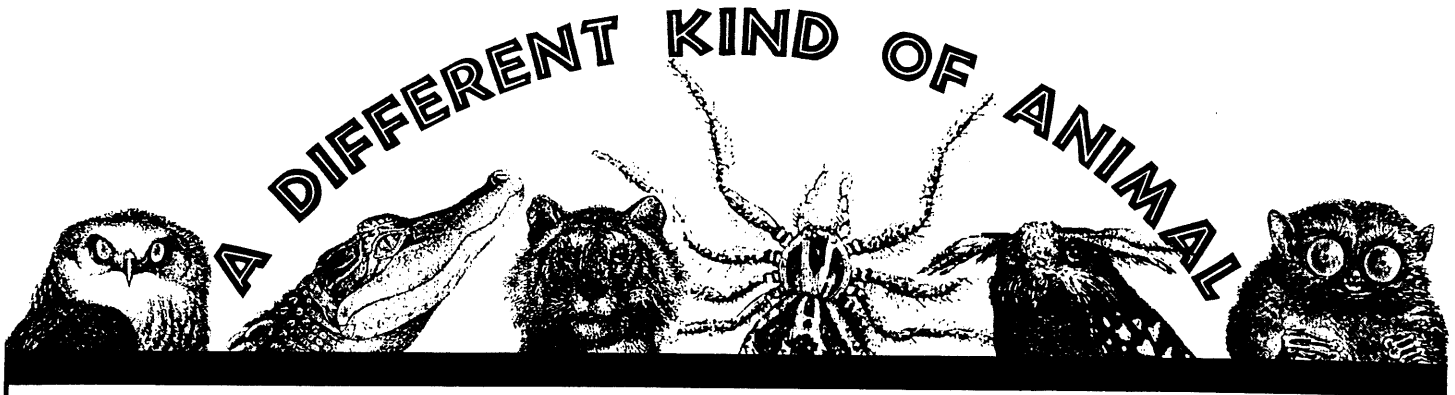

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1565922514
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The desktop reference for Linux. This book shows you what's under the hood of your system. This isn't a scaled down quick reference of common commands, but a complete reference containing all user, programming, administration and networking commands. Contents include, pattern matching, sed, gawk and perl commands, software development commands, shell syntax for the bash, csh and tcsh shells and more.

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Microsoft Windows NT Server 4.0 versus UNIX

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Microsoft Certified Professional (Windows NT)

Editor's Note: Special thanks to John for permission to reproduce this article in AUUGN.

As John mentions, this article is an ever-changing work. It has been edited for inclusion in AUUGN, but you can see the full article (and all the hyperlinks ;-) at:

http://www.kirch.net/unix-nt.html

EXECUTIVE SUMMARY

IT managers worldwide are being confronted with the question, should we go with Microsoft Windows NT Server or one of the UNIX operating systems? As you may already know, UNIX is not a single operating system; it refers to a family of operating systems which includes AIX, BSDI, Digital UNIX, FreeBSD, HP-UX, IRIX, Linux, NetBSD, OpenBSD, Pyramid, SCO, Solaris, SunOS, just to name the more prominent ones. Windows NT Server is increasing in popularity, but is it increasing the productivity of your MIS operations? Most important of all, though, for you as a manager is, are you increasing the profits of your company when you choose a Microsoft solution?

The bottom line is, which is cheaper? Hardware costs, software licenses, technical support agreements, prices of upgrades/service packs, costs of hardware upgrades, profits lost for every hour of downtime, personnel costs for recovering/recreating data lost due to product defects in the operating system and/or hardware platform required by your choice of operating systems, and personnel costs for systems administrators, these are only some of the factors that contribute to the overall budget resulting from your decision. It is not a trivial consideration.

Although money is the bottom line for you as a manager, given the complex set of factors I've just presented, a technically superior combination of server hardware and operating systems could prove to be less expensive in the long run. UNIX is a mature, technically superior group of operating systems with a proven track record for performance, reliability, and security in a server environment. The almost thirty years of continual development, performed often by volunteers who believe in what they're doing, has produced a group of operating systems--and extremely powerful multiprocessor server hardware tailor-made to its needs, whose performance is still unparalleled by Intel hardware--that not only meets the demands of today's computing needs, but in many cases exceeds them.

Why Windows NT Server 4.0 continues to exist in the enterprise would be a topic appropriate for an investigative report in the field of psychology or marketing, not an article on information technology. Technically, Windows NT Server 4.0 is no match for any UNIX operating system, not even the non-commercial BSDs or Linux. A manager is not expected to have the technical expertise of a systems administrator with 15 years of industry experience. There is no shame in not having the facts, only in being ignorant of such facts, which will in the end cost your employer, and eventually all consumers, money. The aim of this article is to give you these facts, and prove that they are facts, because facts are not debatable.

The following article relies on my experience in this industry, which started back in 1979 with Chevron Geosciences Company, and on roughly 150 links to other technical articles, white papers, and executive summaries. At this point it should be noted that I am not promoting the product of any one company, nor would my employer benefit should you choose UNIX. My goal is to ease the burden of systems administrators, promote more efficient and economical computing worldwide, and encourage a more fair and diverse community of software vendors.

INTRODUCTION

The choice of server platforms can be difficult for managers who do not have highly specialised training in systems and network administration. In this paper, Microsoft Windows NT Server is compared to UNIX, a large family of commercial and non-commercial operating systems with a common heritage and many similarities. The main focus of the comparison is on the areas of functionality, reliability, system management, and performance. This paper is about servers, not workstations. Other factors, such as product pricing, quantity and quality of bundled software, and a section on common misconceptions about both groups of operating systems are presented to provide a more complete view of these products. The information used in this comparison is derived from a variety of sources: white papers, case studies by third parties, articles from technical periodicals, and observations made by IT professionals who have industry experience in the implementation and administration of both Microsoft Windows NT and various UNIX operating systems.

This article should be considered a work in progress. Anyone wishing to contribute to this project is welcome to send me e-mail. Please confine your e-mail to constructive comments or criticism.

OPERATING SYSTEMS

Product costs and licensing issues

Most managers will agree that the mere cost of an operating system is trivial when looking at the big picture. Although Windows NT Server 4.0 can be more expensive than some commercial UNIX operating systems (NT 4.0 Server five-User version - $809; 10-User version $1129; Windows NT Server, Enterprise Edition 4.0 25-User Version - $3,999; Enterprise Edition 4.0 50-User Version - $4,799; NT Server 4.0 Documentation Kit - $69.95; Source: Microsoft[1]), it can be had for trivial amounts at trade shows. Is NT Server really worth its price? See "NT Lies: Lie 6 - NT Server is worth more"[2]. What is not trivial, however, is that a networked operating system in this price range should ship without a telnet server, SMTP server (e-mail), disk quotas, news server, or at least a DNS server that works to customers' satisfaction (many NT administrators feel compelled to go with third party DNS solutions). In order to match the functionality of a BSDI installation, additional Microsoft products and third-party solutions would bring the final price of a comparable NT solution to around $4,000, according to BSDI. Maggie Biggs, a senior analyst in the InfoWorld who specialises in database technology and application design, development, and deployment via intranets and other networks, estimates a price of $4,636 for a comparable Windows NT 4.0 solution in her article[3] which compares NT 4.0 to Red Hat's commercial Linux (for only $49.95). Here one sees that successful marketing can often distract customers from considering their need for functionality.

NT is often chosen for budget reasons since many customers are not willing to pay for the more expensive hardware required by most commercial flavours of UNIX. More important, however, is the overall cost of implementation, which includes system
administration along with several other factors like downtime, telephone support calls, loss of data due to unreliability, etc. For a more detailed discussion of NT's hidden costs, see the following InformationWeek article:

> "Windows NT systems carry lower sticker prices than their Unix counterparts, but ongoing maintenance and support requirements can make them much more costly to run."
>
> Martin J. Garvey, "The Hidden Cost Of NT"[4], InformationWeek, 20 July 1998.

Tippett Studio, the company responsible for the graphics in Starship Trooper, which received an Oscar nomination for Best Special Effects, uses 130 SGI (Silicon Graphics, Inc.) machines running IRIX, SGI's very own UNIX operating system. Tippett's studio operations manager explains why they use SGI with IRIX instead of an NT solution:

> "'SGIs are cheap for what they do,' says Tippett's Jeff Stringer, the studio's operations manager. 'The cost of maintaining an NT system is pretty high when you think of all the system administrators that you have to hire.'"
>
> "Hiring is an especially big concern for the small studio. Unlike the super-studios, Tippett -- which designed the bugs that threaten humanity in "Starship Troopers" -- is an f/x boutique."
>
> Greg Lindsay, "Oscar Tech"[5], The Netly News, 27 February 1998.

For the most cost-conscious customer, Linux, FreeBSD, NetBSD, or OpenBSD would be the obvious choices. They cost nothing, yet they are just as stable and offer as much functionality as, if not more than, the commercial UNIX operating systems. One reader informed me that mentioning Linux would detract from the credibility of this article. I beg to differ. The existence of such alliances as mentioned in the article "Andreessen Sees Mozilla-Linux Upset of Windows"[6] clearly shows that Linux is strengthening its presence in commercial environments. (For newcomers to this arena, Mozilla is the name of the Netscape/Communicator code and Marc Andreessen is Cofounder and Executive VP of Products at Netscape.) Also noteworthy is a new alliance between Sun Microsystems and Linux International. (Slashdot: "Sun Joins Linux International"[7], 21 May 1998) Yet another recent development is Corel's special relationship with Linux:

> ". . . Corel, which has already announced plans to build a Linux-based network computer, said it will next month post free Linux-based development tools to its Web site, joining a number of software companies supporting the Linux open source movement."

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[1] http://www.microsoft.com/NTServer/Basics/Pricing/RetailPrice.asp
[2] http://www.zdnet.com/pccomp/features/fea0797/nt/sub6.html
[3] http://currents.net:80/magazine/national/1524/inet1524.html
[4] http://www.informationweek.com/692/92iuhid.htm
[5] http://cgi.pathfinder.com/netly/article/0,2334,13125,00.html
[6] http://www.techweb.com/wire/story/TWB19980402S0013
[7] http://slashdot.org/articles/98042117302l4.shtml

Erich Luening, "Corel joins Linux fest"[8], CNET News.Com, 8 May 1998.

The very latest headlines indicate that Linux is well on its way into the major leagues: "Informix, Oracle ready to port to Linux" (PCWeek Online, 20 July 1998), "Oracle to port database to Linux"[9] (PCWeek Online, 20 July 1998), and "Netscape: Linux a top priority"[10] (CNET News.Com, 7 April 1998).

Historically, large corporations have steered clear of free software due to the unfounded assumption that anything free can't be worthwhile. The recent trend among some corporations is to use these cost-effective operating systems. Hewlett-Packard used Linux instead of its own HP-UX operating system "to port the Carnegie Mellon Mach kernel to HP PA-RISC in order to use it for their imagery work." (full story[11]) Schlumberger chose Linux over SCO for its new point of sale computers. (Linux Journal, November 1997, Issue 43, pp. 83-4) It is interesting to note that SunWorld On-Line gives Linux positive press in one of its articles, "Linux lines up for the enterprise"[12]. Since these operating systems are free for use even in commercial environments, many ISPs run on Linux or FreeBSD. NetBSD will run on practically anything: DEC Alpha, Motorola 68k (Amiga, Atari, Mac, MVME, Sharp, Sun3), PowerPC, Intel, DEC VAX, Acorn RISC, MIPS (Sony NEWS, DECstation), etc. OpenBSD's primary focus is on correctness and security. Linux is the most popular and will run on a wide range hardware: Sun, Intel, DEC Alpha, PowerPC, PowerMac, etc. Paul Krill's recent articles in InfoWorld ("Linux picking up steam"[13] and "Linux supporters rally around freeware OS"[14]) focus on the ever increasing support of major vendors and future plans for added functionality, i.e. support for Intel's 64-bit Merced processor. Currently, Linux is perhaps the fastest growing operating system on the market. For more information, see Linux Resources[15] or Red Hat Software[16].

Nicholas Petreley, editor-in-chief of NC World and columnist for InfoWorld and NT World Japan provides an explanation for the rise of Linux and FreeBSD in IT departments:

"Yesterday's college students learned their UNIX expertise on Linux and FreeBSD. Today they're working in IT departments, and many of them are openly hostile to both Microsoft and Windows NT. As a result, Linux, BSD, Solaris, and other forms of UNIX are finding their way into IT departments, both overtly and on the sly.

"For example, are you sure that's an NT server you're connecting to at work? IS employees in many corporations have secretly installed UNIX servers that provide native NT services. Why take such a risk? Linux and FreeBSD are free, as is SAMBA, the software that provides NT services. So the IS department saves money. And managers are unlikely to find out UNIX is behind the scenes because fewer people will complain about server downtime.

"Fewer people will complain because the servers are more stable than Windows NT. Linux, FreeBSD, and BSDI UNIX outperform Windows NT by a wide margin on limited hardware, and under some circumstances can perform as well or better than NT on the best hardware. Once behind in scalability features, UNIX on Intel is catching up and may soon surpass NT in the number of processors it can use, and how it uses them.

Nicholas Petreley, "The new UNIX alters NT's orbit: The re-emergence of UNIX threatens to modify the future direction of NT"[17], NC World, April 1998.

Even The Economist is now reporting on the rising popularity of Linux:

"Oracle, a database firm, is planning to offer Linux versions of some of its software. . . . Even without such endorsements, Linux has achieved a measure of success. In only a few years, the program has evolved from a hacker's toy into software that is, at least in part, technically superior to Windows NT."

Stephen Morley, "Revenge of the hackers"[18] The Economist, July 11th - 17th 1998.

Functionality

What can you expect from Windows NT Server out of the box and from UNIX out of the box? NT can communicate with many different types of computers. So can UNIX. NT can secure sensitive data and keep unauthorised users off the network. So can UNIX. Essentially, both operating systems meet the minimum requirements for operating systems

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[8] http://www.news.com/News/Item/0,4,21929,00.html

[9] http://www.zdnet.com/pcweek/news/0720/20morac.html

[10] http://www.news.com/News/Item/0,4,20863,00.html?st.ne.ni.rel

[11] http://www.ssc.com/lj/issue44/2355.html

[12] http://www.sun.com/sunworldonline/swol-01-1998/swol-01-linux.html

[13] http://www.infoworld.com/cgi-bin/displayStory.pl?980710.whlinux.htm

[14] http://www.infoworld.com/cgi-bin/displayStory.pl?980715.ehlinux.htm

[15] http://www.linuxresources.com/

[16] http://www.redhat.com

[17] http://www.ncworldmag.com/ncworld/ncw-04-1998/ncw-04-nextten.html

[18] Hyperlink is gone. Can be purchased from The Economist via their online archive

functioning in a networked environment. Put briefly, UNIX can do anything that NT can do and more.

NT is often considered to be a "multi-user" operating system, but this is very misleading. An NT server will validate an authorised user, but once the user is logged on to the NT network, all he/she can do is access files and printers. The NT user cannot just run any application on the NT server (in order to take advantage of the superior processing power of server hardware). An NT user can only run special applications that have been written in two pieces; i.e. client/server applications. When a user logs in to a UNIX server, he/she can then run any application (provided the user is authorised to do so), thus taking the processing load off his/her workstation. This also includes graphics-based applications since X-server software is standard issue on all UNIX operating systems.

For most businesses, e-mail has become an indispensable tool for communication, and most companies run their own internal/external e-mail systems. With Windows NT, you will have to buy a separate software package in order to set up an e-mail server. UNIX operating systems come with a program called Sendmail. There are other mail server software packages (or MTAs, Mail Transport Agents) available for UNIX, but this one is the most widely used, and it is free. Some UNIX administrators feel that exim or qmail are better choices since they are not as difficult to configure as sendmail. Both exim and qmail, like sendmail as well, are free for use even in a commercial environment. Many NT-based companies use Microsoft Exchange Server as their MTA. This is an expensive solution with limited success in an enterprise environment. Microsoft Exchange Server Enterprise Edition - 25 Client Access Licenses costs $3,549.00. If you have more than 25 employees, the same package with 50 Client Access Licenses costs $4,859.00 (Source: Microsoft[19]) Later on in this article, the section entitled Mail Servers (MTAs), provides a basis for comparing and contrasting these two mail server software packages.

Since Microsoft sees NT as a viable alternative to all other network-capable operating systems on the market, UNIX and Novell included, one would assume that NT would come with all the tools necessary to accomplish the most basic tasks required: file and printer services. Any systems/network administrator knows from experience that there are two important issues to be considered when setting up a file server or adding a new network user: security, i.e. passwords and file permissions; and quotas for limiting disk usage of any new or existing users or groups. Although NT provides basic password security, it only provides file-level security if you choose to use its proprietary filesystem called NTFS. Some MIS departments are reluctant to implement this file system (at least on users' machines), because they feel that recovering from disk problems is hindered by the use of NTFS. It is a common belief that NTFS formatted drives cannot be read by DOS, an important OS in the recovery from such problems. Rune Knapstad informed me of a DOS utility called NTFSDOS which can mount NTFS partitions. It is interesting to note that this is a third-party product and not a Microsoft one. More important than this issue, however, is that NT does not provide any mechanism for limiting a user's disk usage! UNIX and Novell, on the other hand, provide software for performing this seemingly elementary control. Microsoft has announced, however, that its not yet released NT Server 5.0 will provide "new storage management features such as disk quotas . . ." (see their press release, "Windows NT 5.0 Beta Delivered to Over 200,000 Developers"[20]).

Another disk related design flaw in the Microsoft suite of operating systems is its antiquated use of "drive letters," i.e. drive C:, drive D:, etc. This schema imposes hardware specific limitations on system administrators and users alike. This is highly inappropriate for client/server environments where network shares and file systems are to represent hierarchies meaningful to humans. UNIX allows shared network filesystems to be mounted at any point in a directory structure. A network share can also span multiple disk drives (or even different machines!) in UNIX, thus allowing administrators to maintain pre-existing directory structures that are well-known to users, yet allowing them to expand the available disk space on the server, making such system changes transparent to users. This single difference between the UNIX and Windows operating systems further underscores the original intentions of their respective designers: UNIX was conceived as a client/server operating system for professional use, whereas Windows and its descendants sprang from DOS, an operating system that was never intended to be a player in a client/server environment, much less a server. For more detailed information on this topic, see Nicholas Petreley's article "It will take less drive to make most PC operating systems work like Unix"[21].

Last but not least, UNIX operating systems are equipped with scripting languages (Bourne Shell, Korn Shell, C Shell, and sometimes Perl, just to name a few) and a "cron" facility for scheduling jobs to run at fixed intervals (every n minutes, every n hours, once a week, once a month, etc.). Cron scheduling is highly configurable and not just limited to these examples here. In short, high-level scripting languages + cron = a powerful resource for system

[19] http://www.microsoft.com/exchange/guide/erp.asp?A=2&

[20] http://www.microsoft.com/corpinfo/press/1997/sept97/winnt5pr.htm

[21] http://www.infoworld.com/cgi-bin/displayNew.pl?/petrel/np102896.htm

administration, the likes of which cannot be found in Microsoft NT Server 4.0. A great deal of UNIX system administration is automated and customised for site-specific needs through the use of these tools, which in effect cuts down on personnel costs. As one reader pointed out, NT does have a "Scheduler" and an "at" command, and that Perl is available for NT. Yes, this is true, however, I don't feel that NT's limited cmd.exe scripting environment combined with the "Scheduler" or "at" can even begin to approach the functionality offered by the UNIX tools I've mentioned. Running automated tasks is only useful when the scripts/tasks/executables can be run without human intervention. So much that runs on NT is GUI-based, and thus, requires interaction with a human administrator. If seen realistically, the types of automated tasks that are being run in most shops are site-specific routines that have to be programmed by system administrators. Based on my own industry experience, it is a rare site indeed where Perl is installed on NT servers and there is any NT administrator who knows the first thing about Perl. The driving force behind buying cheap hardware goes hand-in-hand with the hiring practice of selecting the cheapest NT administrators available; after all, it's NT, all you have to do is point and click!

To summarise, once you logon to an NT network, all you can do is read files and print. In a UNIX environment, once you log in to a UNIX server, you can be on that machine and do anything on it that you could do if you were sitting at its keyboard and mouse! With NT, don't plan on being able to set up an e-mail server with the software at hand. You will need to buy expensive mail server software like Microsoft Exchange Server separately. If your NT server should function as a file server - what else can you do with it really? - don't plan on being able to prevent users from crashing the server by filling up the disk(s) with their data.

Ease of configuration and being able to configure a server without causing downtime is yet another aspect of functionality:

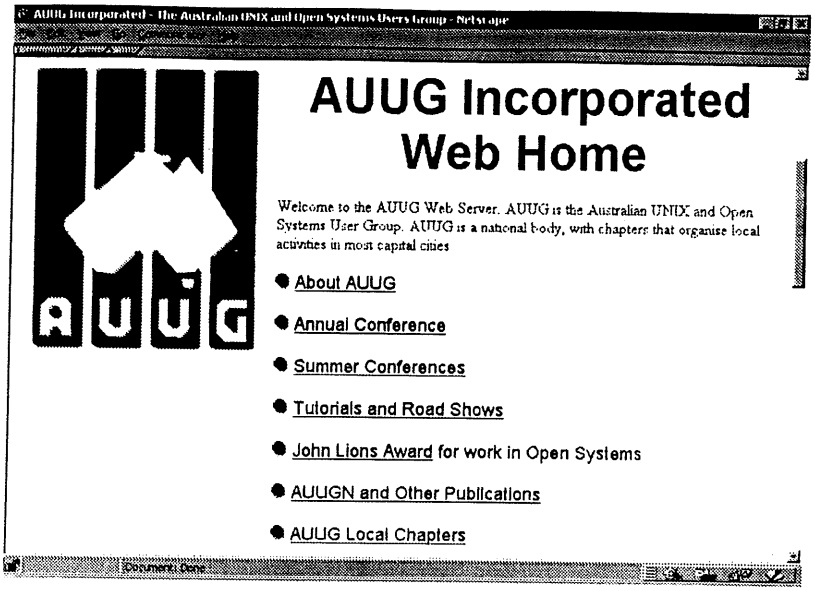
> "Some versions of UNIX (Linux, for example) support loadable device modules. This means you can boot Linux and reconfigure its support for hardware and software on the fly. For example, you can boot Linux without support for the SCSI card you have installed. You simply load support for that SCSI card when you need to access one or more of the SCSI-connected devices, such as an optical disk for backup. You can unload the SCSI driver when you're finished. You can also freely load and unload support for sound cards, network cards -- even file systems such as HPFS, FAT, VFAT, and others (an NTFS driver is in the works)."
>
> "Any UNIX with loadable module support is therefore by nature more appropriate for a server environment because almost all configuration changes do not require system restarts."
>
> "Windows NT doesn't even come close. Even insignificant changes to a Windows NT configuration require or request a shutdown and reboot in order to make the changes take effect. Change the IP address of your default gateway and you need to reboot. You can't even change the type of modem you use for a dial-up PPP connection without a reboot to update the system. None of these limitations exist in UNIX."
>
> Nicholas Petreley, "The new UNIX alters NT's orbit: The re-emergence of UNIX threatens to modify the future direction of NT"[22], NC World, April 1998.

When it comes to more sophisticated networking functionality, it seems that Microsoft's NT Server 4.0 Enterprise Edition can't hold a candle to the more mature commercial UNIX operating systems. Although not essential to network performance, 64-bit computing is here today with these UNIX operating systems (as opposed to NT's 32-bit operating system). D.H. Brown Associates Inc. reports the results of their analysis as follows (the following quotation along with the table and the three graphs immediately following the table are excerpts from a Web page on Digital Equipment Corporation's site entitled "AIX 4.3 Leaps To 64-Bits In Dead Heat With Digital UNIX 4.0"[23]):

> AIX 4.3 takes the lead in Internet/intranet networking features by providing the broadest set of TCP/IP extensions and adding value with a bundled Notes server. Digital UNIX comes in second place with strong network security capabilities, bundling not only Web-browsing capabilities but also Web-authoring tools, with Navigator Gold, and a solid set of TCP/IP extensions. However, Digital UNIX lacks advanced NFS features such as CacheFS and AutoFS. IRIX 6.4 places third, bundling CacheFS and AutoFS, and network security features almost as strong as Digital's. But IRIX lacks network time facilities (NTP) and TCP/IP capabilities such as IPv6 and IPSec. Sun follows, with good support for NFS functions and the second-place array of TCP/IP extensions. However, Sun relies on its own Web server, rather than Netscape, Microsoft or Apache, and lacks authoring tools as well as important services such as Novell's NDS directory service. HP provides strong Internet support within HP-UX, bolstered by its good showing in advanced Internet protocol function and network security, while lagging behind in support for advanced NFS capability. HP-UX, along with AIX, has also established a lead in supporting NDS. While Microsoft NT 4.0 provides Internet/intranet support

[22] http://www.ncworldmag.com/ncworld/ncw-04-1998/ncw-04-nextten.html

[23] http://www.unix.digital.com/unix/v4/dhbrown/AIX43.htm



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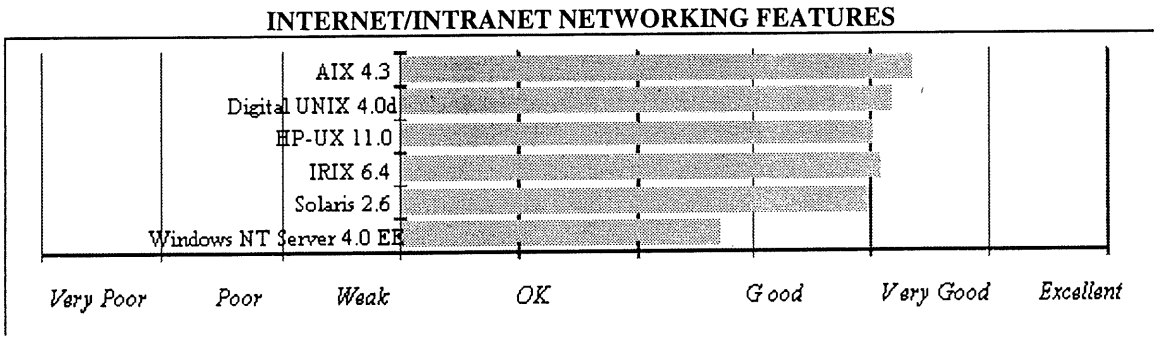
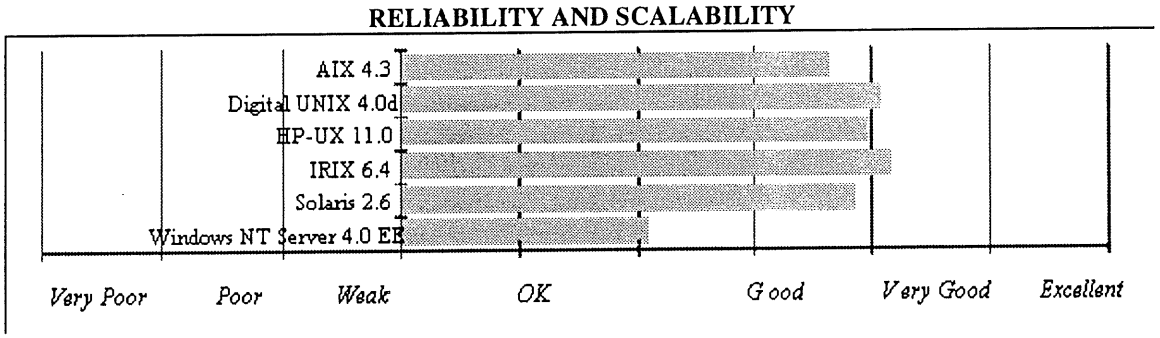
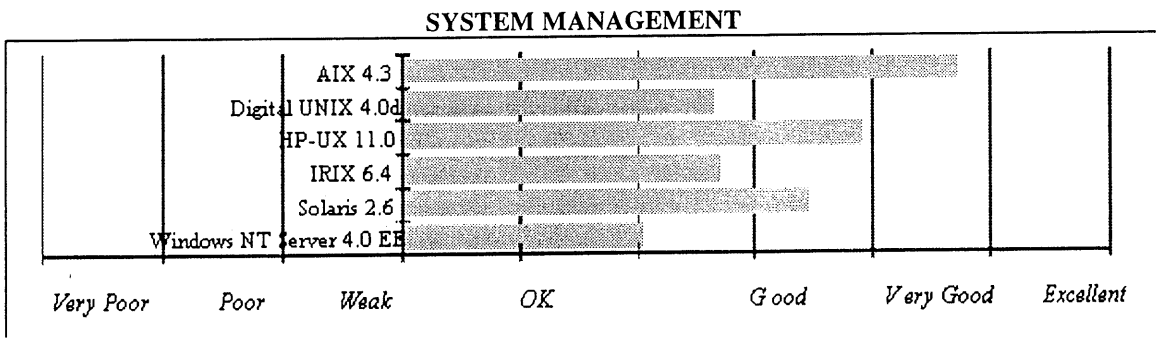
that overall rates as "Good," NT lags behind the leading UNIX vendors due to poor support for directory services, network security, NFS, and few TCP/IP extensions. Microsoft has largely focused adding value to its bundled Web server product and to tuning its Java Virtual Machine.

	HP-UX 11.0	Solaris 2.6	AIX 4.3	Irix 6.4	Digital UNIX 4.0d	NTS 4.0/EE
Extension						
IPSec	Yes	No	Yes	No	Yes	No
IPv6	Yes	Yes	Yes	No	Yes	No
RSVP	Yes	Partial	Yes	Yes	Yes	No
IP Multiplexing	Yes	Yes	Yes	No	No	No
IP Multicast	Yes	Yes	Yes	Yes	Yes	Partial
Performance Optimisations						
Telnet in kernel	No	Yes	Yes	No	No	No
Kernel Sockets	No	Yes	Yes	Yes	Yes	No
TCP Large Windows	No	Yes	Yes	Yes	Yes	No
Zero Copy TCP/Hardware Checksum	No	Yes	No	Yes	No	No
Path MTU Discovery	No	No	Yes	Yes	Yes	No
Open Shortest Path First (OPSF)	Yes	No	Yes	No	Yes	Yes
RTP: Real Time Protocol	No	No	Yes	Yes	No	No
RTCP: Real Time Control Protocol	No	No	Yes	Yes	No	No
Parellelised TCP/IP	No	Yes	Yes	Yes	Yes	No







Reliability

In today's world, reliability is often more important than speed. Although performance is largely a function of hardware platform (see the next section), it is in the area of reliability that the choice of operating systems has the most influence. Even if one operating system offers more functionality, is more

scalable, and offers greater ease of system management, what good are these advantages when a server processing real-time financial transactions is plagued by frequent crashes resulting in unacceptable downtimes? The analogy of a fast, economical automobile with lots of gadgets, and sporty appearance that frequently stalls in traffic despite repeated visits to the authorised service center is actually quite representative of Windows NT.

One often hears about Windows NT Server being referred to as a "stable" operating system, but this is not entirely accurate. Were it so, then we wouldn't be reading articles like NT Lies: Lie 5 – "NT is robust and crash-proof, Software glitches leave Navy Smart Ship dead in the water"[24] (Gregory Slabodkin, Government Computer News, 7-13-98), "Corporate IT needs an engine that never quits"[25] (Peter Coffee, PC Week 3-30-98) or "We do not have a failure to communicate"[26] (Peter Coffee, PC Week 04-13-98). When the author of these last two articles posed the question, "What do you use when failure is not an option?" he was bombarded by "three times the usual number of vigorous e-mail replies." Concerning these replies he states:

> "Notably, I did not get a single message from anyone who took the position that Windows NT was good enough. Quite the opposite: Several messages expressed a resigned expectation that Windows NT 5.0 would stagger out the door, burdened with immature add-on services but without achieving corporate-class reliability in its basic functions."
>
> "I heard from one reader who said that at his site, Linux on a 486 is outperforming Windows NT on a 200MHz Pentium, and he has Linux machines that have been running without interruption since before Windows NT 4.0 was released."
>
> "I also heard from enterprise-class sites where Linux is considered a proven choice, with source-code accessibility outweighing the dubious advantage of more traditional vendor support. What others promise someday, Linux gives many users now--at a bargain price."
>
> Peter Coffee, "We do not have a failure to communicate"[27], PC Week, 4-13-98.

Indeed, Windows NT is a great improvement over Windows 3.1 or Windows 95, but it still has a long way to go before it can reach the level of stability offered by even the freeware UNIX operating systems.

> Windows NT's lack of stability is a known issue yet managers tend to deal with it in discrete ways, reports one IT professional:
>
> "'I know three companies that are silently putting more and more into UNIX . . . at the expense of NT, simply because NT falls over too often,' says Peter Flynn, a consultant in Cork, Ireland. NT is known to crash too frequently for many IT manager's tastes. Typical causes are memory access violations and I/O errors.
>
> "These companies aren't inclined to talk about their decisions 'because of pressure from upstairs,' Flynn says. 'The buy-Microsoft-only ethos has taken over from the buy-IBM-only, and managers who decided [against advice from technology people] to use NT rather than UNIX are now unwilling to lose face,' he adds.
>
> Mark Gibbs, "Lookin' into Linux"[28], Network World, March 30, 1998.

Any IS professional who has worked in a Windows NT environment has intimate knowledge of the infamous "Blue Screen of Death," a situation in which the normal desktop windowing system disappears completely and is replaced by a full screen of hexadecimal numbers on a blue background. The only method of recovery in this situation is powering the machine off and rebooting. What causes "blue screens" in NT varies. In my own experience, the following can induce this state of failure:

- When both IPX/SPX and TCP/IP protocols are used and technicians put a machine with a static IP address on a different subnet;
- When some 16-bit Visual Basic applications are not being run in "separate memory space." NT does not run them in separate memory space by default. This is a manual configuration which should be set for each and every 16-bit application on the machine;
- Certain brands of memory modules or cache will induce this, even though the same hardware runs fine under other operating systems, such as Windows 95.

In some situations, Linux too will complain about its hardware. I personally have not experienced this despite having installed Linux on a wide variety of hardware, but it may happen. It appears to happen mainly when one is compiling the kernel on a machine with bad memory. For more information see Signal 11[29]. The above list is by no means complete. As a matter of fact, Tim Newsham, a software

[24] http://www.zdnet.com/pccomp/features/fea0797/nt/sub5.html
[25] http://www.zdnet.com/pcweek/opinion/0330/30coff.html
[26] http://www.zdnet.com/pcweek/opinion/0413/13coff.html
[27] http://www.zdnet.com/pcweek/opinion/0413/13coff.html
[28] http://www.nwfusion.com/intranet/0330linux.html
[29] http://www.bitwizard.nl/sig11/

developer for both Windows and UNIX platforms, found this short list very misleading:

> In the BSOD section you mention a few ways that a BSOD can be caused. I think this (small) list is misleading to the reader. There are so many ways that an NT system can crash, that by listing a small number you are likely to give the wrong impression. More dangerous yet is the fact that your cases mostly involve a person who is on the console doing something BAD to cause a crash. Many of the ways to crash an NT system happen inadvertently in the day-to-day operation of the system (indeed, leaving the system on too long while running a myriad of applications can cause bizarre crashes with little clue to their cause). Additionally malicious users can trigger crashes due to shoddy implementation in software modules such as the login program (LSA) or the tcp/ip stack.

The "Blue Screen of Death" can be commonplace in some computing environments and is often difficult to troubleshoot due to the either cryptic or non-existent error reporting. In addition to this, NT is particularly prone to virus attacks on the Intel-based hardware. For operating systems on Intel hardware that must be booted from a hard drive, i.e. NT Server, the Master Boot Record of a hard drive can be the death of the operating system. Linux, along with several other UNIX operating systems that run on Intel-based hardware, can load a compressed kernel from a boot floppy, thus avoiding this problem. What this means is, an NT Server can theoretically be crashed by a virus written 10 years ago for MS-DOS computers. Anyone planning to deploy an NT Server in a mission critical environment should consider this fact. I personally have encountered MBR viruses in a corporate environment running Windows NT 4.0 (no Windows 95 clients!), and their effects are devastating. In addition to this, most viruses that would incapacitate a Windows operating system don't have an effect on UNIX operating systems since they often require the MS Windows environment to do their damage.

One real-life situation involving NT's reliability is reported by the University of Nebraska Press's Information Systems Department manager, Quinn P. Coldiron, who writes,

> Life after moving Cats [an order fulfilment and inventory system] to NT was a nightmare. The system was crashing two to three times a day with no reason that I could find. I was on the phone with Microsoft and Cats constantly, but nobody could figure it out. Microsoft had me apply Service Packs one through three and a few HotFixes, which helped, but it still was crashing at least twice a week with the infamous "Blue Screen of Death". After many weeks and about $1500.00 in phone support from Microsoft, the technical support rep told me that I should find a better software package than The Cat's Pyjamas. This was not the solution I was looking for, since this is the package that a sizeable percentage of presses our size nationwide are running, so I was forced to bring the old Novell server back into production until I could figure something out. . . . Fourteen months later, we are running Linux as our server.

The UNIX equivalent of the "Blue Screen of Death" would be called "kernel panic." It obviously exists, since I have heard and read about it, but I've never been witness to it in my professional career. Although I am sure that UNIX servers do crash on occasion, these are extremely rare events. If and when a UNIX server crashes, it is almost always due to a hardware failure of some sort. Any software induced problems in a UNIX environment generally make themselves known over a period of time, sometimes in the form of overall gradual performance degradation of the system, giving the administrator ample time to track down the source of the problem, correct it, and stop/restart the process (very rarely the entire machine!) causing the problem. In general, a UNIX server is halted only in the following situations:

- Due to a hardware failure, for instance, a hard drive fails;
- A hardware upgrade needs to be performed;
- A lengthy power outage has occurred and the backup power supply resources have been exhausted;
- The kernel is being upgraded.
- A beta kernel is being tested (not recommended for production environments).

If none of the above the above occurs, then a UNIX system's uptime can be measured in years. NT, however, cannot boast of such periods of uninterrupted service. Even if one could eliminate the "Blue Screen of Death," NT is hampered by its own design and use of difficult-to-recreate proprietary binary configuration files, for instance, the NT registry. Read about a massive NT failure[30] that lead to over 10,000 NT machines being rendered useless for any task requiring network resources.

System Management

The argument that Windows NT is easier to manage due to its GUI (point-and-click graphical user interface) is unfounded. The advantage, if any, of GUI over CLI (command line interface, i.e. having manually to type commands from a keyboard) is questionable. The first assumption is that Windows NT has an advantage over UNIX because of its GUI. This is wrong. UNIX operating systems have a GUI as well (see this graphic example[31]).

---

[30] http://www.kirch.net/unix-nt/massive-nt-failure.html

[31] http://citv.unl.edu/linux/LinuxPresentation.html#Ease of administration

"NT has long enjoyed an intuitive user interface for managing single systems, largely benefiting from the exceptional familiarity of the Windows look-and-feel adopted by the NT GUI. However, as users begin to deploy large numbers of servers, and geographically-dispersed servers, some of NT's architectural shortcomings for system management have become more apparent, deriving primarily from its design as a single-user system. The multi-user design of UNIX supports remote access at multiple levels, including the ability to login with a character session, via telnet, to edit configuration files, running GUI tools over the network-enabled X Window System, and now through Java versions of system management tools. NT currently enjoys none of these features. Rather, remote NT management typically involves either installing a local expert, which Microsoft hopes will be easier due to NT's larger volumes and similarity to mainstream Windows versions or relying on layered system management products from Microsoft or third parties. Neither option, though, quite matches the efficiency of managing distributed UNIX systems."

Quoted from: "An In-Depth Analysis of Five Commercial UNIX Operating Systems and Windows NT Server 4.0 (Enterprise Edition)" by D.H. Brown Associates, Inc.

See also: "NT Lies: Lie 9 - Zero administration is here"[32]

Performance

Processing power is largely a function of computer hardware rather than of operating system. Since most commercial UNIX operating systems run only on high-end workstations or servers, it would be ridiculous to compare an IBM SP2 or a Sun Enterprise 10000 to anything Compaq or Dell produces. UNIX has been historically an operating system for high-end hardware. To say that UNIX outperforms NT based on the results of differing hardware would be unfair to Microsoft. On the other hand, Microsoft has reduced, rather than increased, the number of hardware architectures it supports. NT for MIPS has been discontinued due to lack of customers and PowerPC support is only marginal. NT, now reduced to only x86 and Alpha architectures will remain "a poor man's server" as it is commonly referred to in the IT business.

NT's lack of reliability is only surpassed by its lack of scalability. The superior scalability achieved by the commercial UNIX operating systems on their respective hardware is the reason why large corporations with high capacity computing needs cannot switch to NT even if they wanted to. Mary Hubley, Research Director with the GartnerGroup, mentions in her article "NT and UNIX: Irresistible Force vs. Immovable Object"[33] (January 1998) that the public's overly positive perception of NT's capabilities is based mainly on marketing hype:

"Many people believe that NT is easier to use than it actually is, scales better than it does, and is powerful enough to do what UNIX can do. But most of this perception is due to great marketing by Microsoft, and is not reality."

European MikroGraf Corporation has published the results of their own UNIX vs NT performance comparison and explains why:

"Several times a month, customers in the printing and prepress industry ask us what server platform they should use: Unix or Windows NT. Windows NT might be acceptable for day-to-day operations in the average business, but does not handle the loads that publishers typically put on servers."

The interesting thing about MikroGraf's UNIX vs NT comparison[34] is that the same hardware was used in two of the four tests, a Digital Model 2100: once with Digital UNIX as the operating system, and again with Windows NT on the same hardware.

To be fair, one should compare NT Server's performance to that of Linux or FreeBSD, since all three operating systems run on the same hardware, Intel, the hardware-type most often used with NT. Unfortunately, a truly objective analysis of performance would have to based on benchmarks, but these are not plentiful and usually only focus on specific areas like Web performance: "Caldera OpenLinux vs. Windows NT: WebBench Performance Test"[35]. The general consensus among IT professionals is, however, that Linux and FreeBSD greatly outperform NT. Considering that these UNIX kernels are custom-compiled to contain only the software actually required by the administrator, Linux and FreeBSD can function more efficiently than NT. Inherently, any operating system requiring fewer resources will outperform a more bloated operating system like NT. UNIX does not require a graphical user interface to function. NT does. Anyone knows that graphics require incredible amounts of disk space and memory. The same holds true for sound files, which seem to be so important to the Microsoft operating systems.

Benchmarks performed on similar UNIX operating systems using the same hardware are more meaningful. Net Express, an Internet retailer of x86-based hardware, whose systems are "designed for scientists, engineers and the telecommunications

[32] http://www.zdnet.com/pccomp/features/fea0797/nt/sub9.html

[33] http://www.gartner.com/public/static/datapro/industry/indnews6.html

[34] http://www.ugraf.com/unix-nt/jt/unix-nt.nob.html

[35] http://www.caldera.com/news/features/971222.keylabs.html

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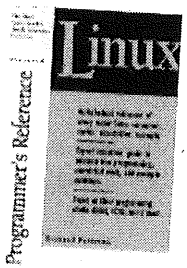

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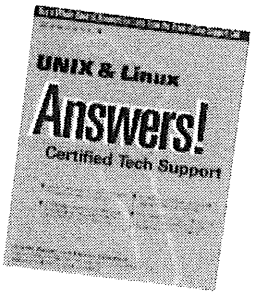

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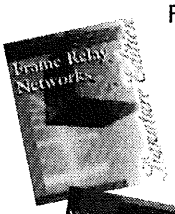

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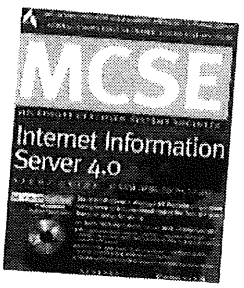

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industry," shows what results can be achieved with the proper operating system:

Byte UNIX Benchmark 3.2 for OS Comparison:

In addition we are presenting these Byte UNIX Benchmark 3.2 results for comparing the relative speeds of three popular UNIX/UNIX-Clone OS's. Tests were conducted on Pentium 133MHz machines with 32MB's of RAM, the Triton-II 430HX chip set and a BusLogic SCSI controller:

System	Bytemarks
Linux on a Pentium 133MHz	12.2
BSD on a Pentium 133MHz	9.8
Solaris 2.5 on a Pentium 133 MHz	6.2
Solaris on a Sun Sparc-II Ultra 167MHz System	13.7
Solaris 2.5 on an Orion Pentium Pro 200MHz	13.5

From these results we can see that Linux is a very efficient OS. Scores for Linux on the Pentium 133 were nearly as fast as Solaris 2.5 on a 167MHz Sparc Ultra or a 200MHz Pentium Pro!!!

Perhaps an example of the performance advantage one could expect to find when choosing a UNIX operating system coupled with the freeware Apache Web Server can be found in an article by Sean Fulton that appeared in INTERNETWEEK on May 5, 1997, "Towers of Power -- We test five muscular Web servers aimed at high-end intranet applications"[36]. For NT, the test results were pretty devastating:

> "Telenet System Solutions produced the most surprises during our tests, with a BSDi-powered, single-CPU system that kept up with-and in some cases outperformed-twin-CPU machines running Windows NT.
>
> "The differentiating factor here was the BSDi 3.0 OS loaded on the machine and its Apache HTTP server software. All of the twin-CPU machines were running Windows NT 4.0 with Microsoft's Internet Information Server 2.0.

While on the subject of Web Server performance, Ariel Faigon points out that an SGI machine running IRIX now holds the world record in this area:

> "As of April 1998, the best SPECWeb result overall is 7214 http operations per second on an 8-CPU Silicon Graphics Origin 2000 server running IRIX 6.5 and a Netscape Web server."
>
> For more details, see SGI's press release[37].

> "In contrast, the best NT number is 1878 ops/sec on a 4-CPU Hewlett-Packard NetServer LXr Pro 6/200 running Microsoft IIS."

Admittedly, the following example might not be the most scientific test of performance difference between Linux and NT, but Richard Betel's information does give one an idea of what one can expect in real-life situations:

> I've been running the distributed.net RC5 cracking client for about 2 months now... It's installed on every server that has a significant amount of idle time. This includes two identical machines: Both are Dual-Pentium II at 300MHz, 128MB RAM. One is running NT, and has an idle exchange server (we're planning to offer a service on it, but at the moment, its totally idle), and the other is running Linux (we're putting that one through its paces. It's a Samba server, and we're recompiling all kinds of things on it). The Linux box is trying keys at 1.8 times the speed of the NT box.

Security

This topic is too vast and complex to be fully addressed in an article of this scope. Security is, however, very important. Jim Mohr points out some interesting facts in his article "The Great Linux-vs-NT Debate"[38] on security[39]. The following links are excellent starting points for comparing the security weaknesses of the various operating systems:

- Probing into C2 security claims: Is NT as secure as Microsoft has said it is?[40]
- NT Lies: Lie 2 - NT is less secure than UNIX[41] (Real security means taking a server off the network and locking it up!)
- NT Lies: Lie 4 - NT Meets Military Standards[42]
- A BYTE article on Windows NT security problems[43]
- NT secured filesystem (NTFS) can be read from Linux, bypassing filesystem security.[44]
- Known NT Exploits[45]
- NT Security - Frequently Asked Questions version 0.41[46]

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[36] http://www.techweb.com/se/directlink.cgi?CWK19970505S0103

[37] http://www.sgi.com/newsroom/press_releases/1998/april/performance.html

[38] http://www.jimmo.com/Debate/intro.html

[39] http://www.jimmo.com/Debate/security.html

[40] http://www.infoworld.com/cgi-bin/displayNew.pl?/petrel/980713np.htm

[41] http://www.zdnet.com/pccomp/features/fea0797/nt/sub2.html

[42] http://www.zdnet.com/pccomp/features/fea0797/nt/sub4.html

[43] http://www.byte.com/art/9711/sec6/art3.htm

[44] http://www.secnet.com/ntinfo/linuxntf.htm

[45] http://www.secnet.com/ntinfo/

[46] http://www.it.kth.se/~rom/ntsec.html

- AFCERT - Security Issues for various operating systems[47]

Some Common Misconceptions

NT is a toy operating system

For an operating system that has evolved from a toy operating system, it offers some professional functionality. Although it does not scale very well -- performance goes down with more than 4 CPUs per server -- it has come a long way. Although I would not recommend it as the primary operating system in an enterprise environment, it should yield satisfactory performance for small businesses with fewer than 250 user accounts that do not run mission critical processes. Please keep in mind, however, that a single NT server will not be sufficient to service 250 users. The general recommendation is one PDC (Windows NT Primary Domain Controller) and two BDCs (Backup Domain Controllers). Having other server applications on the PDC is also not recommended. Should RDBMS, E-mail, Web, and other typical services be required, three NT servers will most likely prove to be insufficient.

By converting everything to Windows NT a company can eliminate the problems of a heterogeneous networking environment.

The first assumption here is that a heterogeneous networking environment is a problem. I once worked at a company where NT and Novell coexisted with very little conflict. As a matter of fact, the very reason for this coexistence was because Novell outperformed NT in the area of file and printer sharing services. With UNIX, one can create Microsoft-compatible file and printer sharing without the users ever knowing that these services emanate from a UNIX server. For all they know, it's an NT server. This functionality is provided for in Sun's UNIX operating system, Solaris. Linux can use a software package called Samba that ships with most distributions to achieve this. Samba is available for practically all UNIX operating systems. It has also been ported to VMS, MVS, OS/2, Stratus-VOS, Amiga, Novell, and MPE/iX.

UNIX is this outdated, cryptic, command-line based operating system.

Wrong! CDE (Common Desktop Environment) is a GUI desktop (Graphical User Interface: you use a mouse to point and click, or drag and drop on a colourful "desktop"; this is the basis for Microsoft's success.). CDE ships with most commercial UNIX operating systems: Sun's Solaris, IBM's AIX, Hewlett Packard's HP-UX, DEC's Digital UNIX, to name a few. For around $90 you can get CDE for Linux if you happen to be dissatisfied with your choice of four GUI systems that ship with Linux: OpenLook, the GUI that Solaris used to use; FVWM, a freeware GUI that has many similarities to the Windows 3.1 GUI; or FVWM-95, another freeware GUI that mimics the Windows 95 GUI (when looking at a single window, one can't distinguish between FVWM-95 and Windows 95). TWM is the predecessor of the various FVWM window managers, which also ships with Linux. If you've never had the opportunity to sit at a computer running UNIX, here are some SCREENSHOTS of these window managers: CDE, TED (TriTeal's CDE for Linux), KDE, FVWM 1.24, FVWM 2.x, FVWM-95, olvwm (OpenLook Virtual Window Manger). These are only some of the GUI interfaces available to UNIX users. Matt Chapman's "Guide to Window Managers for The X Window System"[48] is an excellent resource on this topic. You will find many more screenshots on his site than I am able to list here. Keep in mind that almost all of these window managers are highly configurable; you shouldn't be surprised to see screenshots made of the same window manager which look completely different. As Matt states on his page, "Let's face it, people are different, and those that use computers use them in different ways for different tasks. So why do some think we should all use (suffer?) the same interface?" Ironically, it is Microsoft's graphical user interface that is lacking the features of customisation.

As for the claim that UNIX is behind the times, it is still the operating system of choice for science, engineering, research, and higher education. Most engineers would choose UNIX over NT without hesitation. They are fully aware of its ability to be customised and its tuning capabilities for the optimisation of specialised computing tasks. Readers' feedback to isd confirm this attitude:

> "As we suspected, most designers are adamant: They want their EDA tools to run under Unix. What's more, they say that Linux is technically excellent by every measure, and NT simply isn't. Painfully aware that technical excellence doesn't guarantee market share, many readers say that this time it should."
>
> "Although readers' sentiments overwhelmingly backed Linux, we were impressed with the quality of the input . . . ."
>
> "Engineers Speak Out: Linux vs. Windows NT, Part 1"[49] Murry Shohat, Intergrated System Design Magazine, July 1998.

Everyone is converting to NT anyway, we might as well gradually replace our UNIX servers with NT servers. It's the way of the future.

[47] http://afcert.csap.af.mil/os.html

[48] http://www.PLiG.org/xwinman/

[49] http://www.isdmag.com/Editorial/1998/CoverStory9807.html

If you talk to MIS managers of some large corporations who had UNIX and Novell two years ago, and then replaced their Novell servers with NT servers, you'll find that none of them can manage without their UNIX servers. It seems that heavy processing is still better accomplished with UNIX servers. So far in my career, every Oracle server I've ever seen was running on a UNIX server. One IT professional, however, did send me e-mail saying, "I support several installations of ORACLE on NT. There are performance and functional issues that I encounter which I have never seen on UNIX (Pyramid)."

WEB SERVERS

The life-blood of the Internet is the Web. This is the face that the public sees. If your site is slow, plagued with technical problems, or inaccessible, this will surely have adverse effects. Since most large corporations are UNIX-oriented, they normally go with Web server software like Apache or Netscape-Enterprise. Apache was conceived with UNIX in mind. It is free and currently rules the Internet. Roughly half the Web servers on the Internet are running Apache (see the Netcraft Web Server Survey[50]). Microsoft's IIS Web server software does not even amount to one-quarter of all Internet-connected Web servers. Apache is currently being used by Javasoft, The FBI, Financial Times, The Movies Database, W3 Consortium, The Royal Family, Oxford University Libraries Automation Service, M.I.T., Harvard University, and the University of Texas at Austin. Netcraft also mentions that "Virtual hosting company Rapidsite is now the fifth placed server in the survey. Their hosting system, running a personalised version of Apache, supports 44,280 domain names on 39,905 distinct ip addresses. An achievement, and probably the world's largest hosting system." You will recall that in the performance section of this article the UNIX-Apache marriage put the NT-IIS one to shame. Not only is Apache fast, it's freeware. Apache's rule over the Internet has also been recognised by IBM who now has a partnership with Apache:

> **IBM Teams Up With Apache**
> "IBM will ship the Apache HTTP server with the IBM WebSphere Application Server, helping current Apache users to evolve to e-business solutions. As part of the WebSphere Application Server package, IBM will provide commercial, enterprise-level support for the Apache HTTP Server. In addition, IBM will be a full participant in the Apache HTTP Server Project, a collaborative development effort, and will make contributions to enhance the capabilities of the Apache HTTP Server."
>
> "IBM helps companies turn simple web sites into powerful e-business solutions"[51], IBM News, 22 June, 1998.

For the most robust Web server a corporation could ever need, Netscape-Enterprise is a great choice. Although it is not freeware like Apache, it will meet the most demanding needs. Netscape-Enterprise is used by such companies as BMW, Dilbert, Silicon Graphics, Shell, Sun Microsystems, Sybase, Ferrari and The Vatican.

Microsoft's IIS is one of the few things that actually comes with Windows NT. It does not possess any special or unique qualities not already found in other Web server software. It excels neither in speed, nor in popularity, nor in the number of concurrent hits it can handle. It is currently being used by Compaq, Nasdaq, The National Football League, Exxon, and Tesco. Given the fact that Microsoft owes much of its success to lower priced PC hardware, i.e. Intel-based machines, you would think that this great Microsoft partner would be running IIS. Well, guess again! www.intel.com runs Netscape FastTrack Server. To further substantiate my claim that Microsoft IIS is not up to speed, while testing the validity of the links for the sites above, I discovered that Tesco was unable to service any requests between 00:02:53 and 00:53:07 GMT on Monday, 22 June 1998. Their Web server kept returning the message HTTP/1.1 Server Too Busy despite my repeated attempts from my own domain and from other domains I telnetted into. The Web server never did manage to deliver their home page. I simply gave up after 50 minutes of seeing the same error message from various clients in various domains. I have only ever seen this message from IIS Web servers. Tesco is running Microsoft-IIS/4.0. Telnetting directly into their Web server on port 80 revealed another unprofessional aspect of their site. Despite the wide availability of ntp servers the world over, their system clock was off by 8 minutes and 51 seconds.

For Windows 95 and NT users, one of the most popular places on the Web to get freeware and shareware is a site called www.windows95.com. Due to the immense popularity of the site it requires a robust operating system and performance oriented Web server software. Since all the software offered at this site is exclusively for Windows 95 or NT, and the overall flavour tends to be very pro-Microsoft, one would assume that NT servers running IIS would be the logical choice for their Internet solution. Well, here's a quote from one of their own Web pages:

> **What hardware and software is Windows95.com running on?**
>
> We use Pentium Pro computers running the BSDI UNIX operating system with Apache Web server

[50] http://www.netcraft.co.uk/Survey/

[51] http://www.ibm.com/News/1998/06/223.phtml

software. Our servers are connected to the Internet via multi-homed T3 connections.

Note: This quote is from February 1998. They recently changed their name from Windows95.com to WinFiles.com although they still have use of the windows95.com domain name. This change took place in March 1998.

To verify what an Internet site is running at any given time, I have written a CGI script that will query Web Servers and Mail Exchangers for their currently loaded software type. This is a tool you may find useful for this section and the following one on MTAs[52].

MAIL SERVERS (MTAS)

This section is the result of my interest in a UseNet news thread where the topic was "Sendmail versus Microsoft Exchange Server." Parallel to the main topic of the article, Exchange is frequently the choice of mail server software in predominantly NT environments. Sendmail is standard issue with most UNIX operating systems. It has a reputation for being difficult to configure, but for the generic installations this is debatable. Exchange, however, has other issues associated with it. Although Exchange has some features not found in generic MTA's like sendmail, its lack of robustness and comparatively poor performance with high volumes of e-mail tarnish its otherwise flashy image.

The management of one large company -- comprised of "well over 20,000 IT users" -- decided to migrate to Microsoft Exchange Server. This decision has resulted in anything but a success story. The "migration to Exchange is over half finished" but $3 million have been spent to get to this point. To find out more about this "major problem with 12,000 users and hundreds of servers," see the AberdeenGroup's Case Study: "Horns of a Dilemma"[53].

CONCLUSION

Ironically, it seems from the observations of experienced system administrators that UNIX would be the operating system of choice either for installations on a tight budget or huge corporations with a demand for high-powered multi-processor servers requiring a scalable operating system. Washington Post Staff Writer, Elizabeth Corcoran, provides us with a real-world example:

> Cincinnati Bell Information Systems, for instance, has used Sun workstations and servers to process checks for several years. It recently bought several top-of-the-line Sun servers to handle the demands of a million bills a day. The choices, said James Holtman, CBIS vice president, were either Sun servers or IBM mainframes. Microsoft's technology "isn't quite there yet. It has a ways to grow to match those-size systems," he said.
> (The Washington Post, Sunday, February 8, 1998; Page H01)

Provided that a company is small to medium-sized, has few mission-critical processes to be run, is willing to hire additional administrators for their Microsoft Exchange and Internet Information Server(s), and has a substantial budget for Microsoft's "per server" or "per seat" licensing scheme, then NT would be the operating system of choice. The AberdeenGroup has published an excellent case study[54] on migrating to Windows NT.

NT is also an excellent choice for managers who need to show that they used up their fiscal year budget for hardware/software expenditures. Perhaps this is why it requires no prior purchase approval within federal agencies; "NT has become the 'unofficial' standard operating system for the federal government. Federal employees whose responsibilities include the acquisition of computer hardware/software require prior written approval from above before ordering a UNIX operating system or hardware, which cannot run Windows NT. For Intel-based hardware or Windows NT, no prior approval is required." (as reported by a vendor of Sun solutions who wishes to remain anonymous)

For small shops or power users on a budget, or even medium to large businesses who are beginning to escape the antiquated mind-set that performance is best gauged by the last figure on the sales receipt, Linux or FreeBSD can easily exceed the performance and functionality of an NT solution, do it with inexpensive Intel-based hardware, and do it for $0.00, a price Bill Gates will find difficult to beat. Why invest in an operating system that will require expensive training and re-training with each new NT release? UNIX/Linux administrators are plentiful and generally more technically capable than their NT counterparts (most UNIX administrators have some coding/scripting skills seldom found among the new generation of "NT admins"). Why spend almost $5,000 for MS Exchange Server (this price only covers 50 client accesses), which in some companies, seems to only be able to handle the e-mail of a few hundred employees when you can use the built-in "Sendmail" mail server software that ships with Linux, a tried and proven application capable of supporting the e-mail demands of thousands of employees?

As to the actual overall features and performance of the two operating systems, it seems that UNIX wins

[52] http://www.kirch.net/cgi-bin/siteinfo

[53] http://www.aberdeen.com/research/comp/onsite/case2/body.htm

[54] http://www.aberdeen.com/research/comp/onsite/case1/body.htm

hands down. It offers a variety of vendors (no threat of a monopoly), scalability, more efficient use of system resources, remote administration, remote computing, multi-user capabilities, large palette of (professional) software resources, vendor independent standards (POSIX), control of users' disk usage (unlike NT), and can't be crashed by viruses written 10 years ago for DOS computers. But the most important thing of all to remember from this article when trying to choose between Windows NT and one of the many UNIX operating systems is this:

> A **UNIX** operating system will give you **choices**: any type of hardware, CLI or GUI, commercial or GNU, diverse choice of vendors. It is **dynamic**, i.e. you can build a customised kernel to fit the specific computing needs at hand.
>
> **Windows NT** will give you **restrictions**: only Intel or Alpha; no CLI, only GUI (try booting NT into CLI-only mode) and then only one GUI (no wide choice of windowing systems as can be found under X); only commercial MTAs, only Microsoft (ever heard of another company marketing "NT Server clone" operating systems?), etc. NT Server is **static**, i.e. you will never be able to build a customised kernel. One size fits few.

Although Microsoft is not the only "restrictions-oriented" software vendor promoting its own closed, proprietary solutions, one would hope that organisations promoting open systems and solutions would prevail. Netscape is one vendor that promotes diversity and points out Microsoft's pro-restriction, anti-choice stance regarding various products:

> [Our] strategy is in sharp contrast to that of vendors like Microsoft, whose business model depends on customers upgrading to the most recent version of each operating system. Consider that Microsoft's component model, ActiveX, and the underlying components are designed to run only on 32-bit Windows. Many Microsoft APIs also run only on 32-bit Windows. For example, an application that uses ADSI (Microsoft's API to access the LDAP directory protocol), will not run on existing Win16 clients, much less on Macintosh or Unix systems. Netscape's LDAP API is available on 17 platforms in C and many more in Java. In addition, Microsoft's future platform services like "Viper's" transaction processing and "Falcon's" messaging only runs on NT 5.0 - an Oracle database running on Unix, for example, is not supported. The difference is clear: with Microsoft, developers write to the Windows platform, with Netscape, they write to the Internet platform.
>
> Netscape, Netscape ONE Advantages

It would seem that the question of which operating system to choose would be academic at this point based on the information I have provided here, yet every day some highly-capable systems/network administrator somewhere is told by his/her manager that the company is switching over to NT. The administrator is left stunned and confused, for he/she already knows the information contained in this article. It is the management of your company who should be reading this. All too often management rocks the boat and disrupts the harmony of stable, economical, and technically superior implementations when they suddenly discover that an unapproved operating system has been in use for quite some time, based solely on political reasons:

> "The corporate IT managers notice someday what is that box in the corner and they tell them that it's the departmental Web server that's been running for a year and a half, and by the way it's running Linux. One normal reaction is to upgrade it immediately to NT, but what happens is that they go back to Linux because the performance dropped."
>
> Linus Torvalds talks economics and operating systems, InfoWorld, April 9, 1998.

This very type of incident happened at Cisco Systems Inc. but despite the order from senior management to switch over to NT, they are still running Linux (get the details[55]). Obviously, some of the technical staff refused to comply with this order. Why do you think that technical people risk losing their positions over this issue? I'll leave this question for you to answer.

If you are a manager, try to use this information wisely to enhance the computing environment at your facility. Talk to your technical people and ask them what works. Make the right decision. Don't be fooled by salespeople who use buzz words but can't explain them, let alone explain their pertinence to your company's computing goals. Seek out companies who have implemented both Microsoft and UNIX servers for the type of solution you are considering. Try meeting with their technical people to get objective, first-hand reports on the feasibility, difficulty of implementation, and initial+ongoing maintenance costs associated with your proposed solution.

❖

John currently lives in Austin, Texas with his wife Lisa. John and Lisa previously lived in Germany for nine years, and moved back to Texas in 1995 so that John could finish studies at the University of Texas at Austin.

John currently works as an engineer in Tivoli System's Customer Support Center in Austin.

For more information, check out John's website at:

http://www.kirch.net/

[55] http://www.kirch.net/unix-nt.html#cisco

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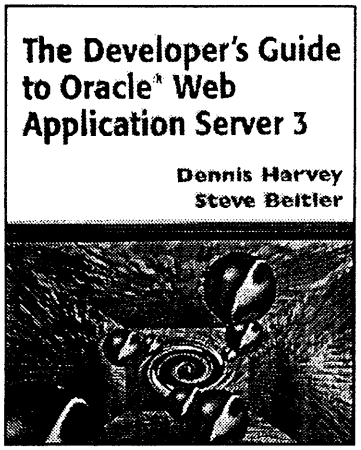

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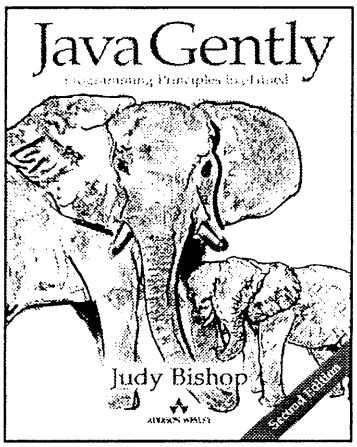

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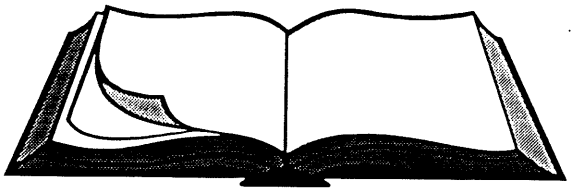

THE JAVA DEVELOPERS ALMANAC 1998

by Patrick Chan
Addison-Wesley

Reviewed by
Mark Delany <markd@mira.net>
Mira Networking Pty Ltd

For those who have never seen an almanac, they normally consist of extensive, densely printed lists. Tide charts, and other static information sources, are typical almanac candidates.

At 962 pages, this book is a classic example of the benefits and failings of almanacs.

It contains page after page of one-line entries for each and every method, in each and every class in each and every package. There are no descriptions or other tutorial-style information. As the author suggests in the introduction, this book is designed to be a quick-reference guide.

On the scale of reference texts, it is the print equivalent of a list of the Synopsis entries for every 'man' page.

Having said that, the book is well structured and the legend against each entry is quite informative. One of the most useful aspects of the legend is that it identifies the revision in which a member was introduced, as well as whether it is deprecated and whether it is an extension package. This is essential information for programmers writing across multiple Java versions.

By definition, almanacs must be extensive, authoritative, up-to-date, accurate and useful.

There is no doubt about the scope of this book. It has an entry for every Java method defined by Sun. Given Chan's role as a founding member of the Java project, and the fact that the "Java Developers ALMANAC - 1998" is Patrick's third contribution under the Sun sponsored "Java Series" banner, there is no question that the information comes for a reliable and reputable source.

Patrick has also worked hard to ensure that his almanac contains the very latest information on each class. Based on Java 1.2, this book includes JavaMail and Java 3D, which are very recent packages indeed. Java probably has the largest and most rapidly changing collection of APIs in the computer industry. Part 3 of the book documents this nicely with a comprehensive list of changes between each version. It's hard to believe that in just three short years we have gone from Java 1.0 with 212 classes, through Java 1.1 with 504 classes to Java 1.2 with a mind-boggling 1,592 classes and 13,635 methods!

But here's the rub. By making such a good job of identifying these changes, Patrick serves to demonstrate the weakness of an almanac that covers such a fast-moving target. Namely that it will rapidly become obsolete a fundamental flaw in any almanac.

So how useful is this book? To answer that question I asked one of our Java developers to take it for a test drive. Given that he is working with 1.2 and using Swing, RMI and JavaMail, I figured if anyone was going to need a quick reference guide, he was.

Well, the book came back virtually unused. It seems that the information provided by the almanac really doesn't answer many of the questions that a programmer asks. More importantly, it is competing against the online documentation, which is much more likely to be up-to-date, which is the first consideration of any experienced Java programmer.

If you are interested in the ebb and flow of Java then the "Java Developers ALMANAC - 1998" is for you. This book will also appeal to programmers who have to write to very strict platform requirements. Apart from that, however, the appeal is likely to be limited.

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WINDOWS NT & UNIX: ADMINISTRATION, COEXISTENCE, INTEGRATION & MIGRATION

Williams & Gardner
Addison Wesley, 1998
738pgs

Reviewed by
Craig Macbride

"Windows NT & Unix: Administration, Coexistence, Integration & Migration" sets out to provide a reference for administrators dealing with both Unix and NT systems. Initially, it delves into structure, design and interface differences between the two OSs. I found the treatment of NT in this regard overly generous. The statement that the infamous "blue screen of death" is "now a very rare occurrence" may be true, depending on what value you place on "rare".

However, the more appropriate comparison, not made in the book, would be between NT boxes that crash every so often and Unix boxes which stay up for months or years.

Even worse, the suggestion made by the author that, when comparing Unix and NT running on Intel hardware, "the overhead requirements are roughly the same", is preposterous. There are many Unix boxes with 16MB RAM happily serving entire offices, while NT users still complain that 16MB isn't enough for a single user.

This book appears to me to be rather biased. However this bias does not taint the book's technical discussions.

As you would expect, the book goes into quite some detail about Unix and NT system administration as a whole, although it is impossible, in a book of this nature, to cover everything in depth.

The treatment of matters such as the use of the Unix shells, including vi, are of sufficient depth to provide administrators with a non-Unix background with at least a working knowledge. However, matters likely to vary widely, such as Motif setup, are mentioned only briefly.

The book also covers Unix and Windows NT network integration, user interface emulators, cross-platform data access, and the movement of applications from Unix to Windows NT.

I imagine that one of the biggest problems with administering a shared Unix and NT environment is that few administrators know both systems well. Two appendices take up approximately one third of the book: one canvasses NT commands and utilities, the other Unix commands and utilities.

While the Unix command descriptions won't be very useful to someone already administering a Unix system, and indeed may be less accurate than the man pages for the specific Unix variant involved, the appendixes do provide one benefit: each lists the corresponding commands and utilities for the other OS. So the Windows NT appendix includes a list of equivalent Unix commands, and vice versa.

However, there are some deficiencies. In the NT appendix, for example, the text correctly equates the "copy" and "xcopy" commands with cp and cat. However, no mention is made of how to copy directory structures under Unix!

Overall, this is a decent reference on administration and comparative Unix/NT functionality. I'm inclined to ignore the authors' opinions on NT vs. Unix and just use the technical information presented. While there are many matters that are not covered in sufficient depths to make this the single reference for all your system administration needs, it does provide enough information to provide pointers on where to look next for more in-depth, system-specific documentation.

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DEPLOYING IP MULTICAST IN THE ENTERPRISE

T.Maufer
Prentice Hall Australia; 1998
275pgs

Reviewed by
Toivo Pedaste
University Computing Services
University of Western Australia

"Multicast" can be considered a form of directed network broadcast. It involves sending the same packets to some (but not all) hosts on a network.

Multicast technology has been most visible in the MBONE, the experimental multicast backbone layered over the normal Internet. MBONE carries broadcasts of multimedia programs, such as the IETF meetings and space shuttle flights.

The protocols associated with multicast on the Internet have been developed by the Internet Engineering Task Force over the last five years and are now being included in routers and other networking equipment. Multicast packets are distinguishable from other packets as they have addresses in what is known as the D class range, which is the 1/16 part of the IP address space above the A, B and C normal unicast ranges.

While multimedia is the most obvious application for multicasting, one of its more practical uses lies in local area network routing protocols, as it allows routers to communicate with each other without loading the hosts with broadcast traffic.

The book's title, "Deploying IP Multicast in the Enterprise", suggests that it is a practical guide to installing an established technology. However, multicast isn't an established technology, and the book isn't a "how to" guide. However, the book does provide a good overview of IP multicast technology and the current and proposed protocols associated with it. While it contains an introduction to IP and IP addressing, a basic knowledge of IP protocols is assumed.

Following an introduction to multicast, there is a section on Internet Group Management Protocol (the host to router protocol) and an introduction to multicast routing. The next section covers current and future routing protocols, including DVMRP (as used in the MBONE) and Protocol Independent Multicast (the protocol defined by the IETF). Also canvassed are future applications, such as Service Location

Protocol (a protocol for finding services on the Internet), and various schemes for reliable multicast (that is multicast with error recovery). The book also offers two case studies: one is the multicast setup at the Interop trade show and the other is the planned multicast configuration at the Jet Propulsion Laboratory.

In general, the book is a useful introduction to the technology behind the current state and possible future developments in IP multicast, though, as the selection of case studies indicates, the practical deployment of multicast is currently not great. One noticeably absent topic that will affect the deployment of multicast over the Internet - is that of how bandwidth costs can or should be allocated.

At the University of Western Australia I've turned on multicast in our routing infrastructure, however we are yet to find an application that people want to run that requires it.

❖

THE JAVA CLASS LIBRARIES

Chan, P., Lee, R., & Kramer, D.
2nd Ed., Vol 1. Addison-Wesley, 1998
2050pgs.

Reviewed by
David M. Williams
I.T. Manager
Information Systems Group
The University of Newcastle

This weighty tome (2050 pages in all) is somewhat formidable, especially when one realises that it covers just six of the Java API packages - io, lang, math, net, text and util. A second volume (not reviewed) covers applet, awt and beans.

However, the reader's internal fortitude is well rewarded, as it contains a veritable wealth of information. In just a short few weeks, this book has become an invaluable part of my reference library.

'The Java Class Libraries' is a comprehensive reference guide to the standard Java 1.1 class libraries. Each package and class is expertly deconstructed, providing explanations of individual member properties and extensive cross-referencing with related members. Class hierarchy diagrams that map connections with other classes are also available, which, for me, proved quite helpful when developing JavaBeans that inherit from an existing class.

Although there are several Java API reference works available - and one can always peruse published source code to obtain lists of methods - this book is a worthwhile investment, if for no other reason than for the quantity and quality of code provided as illustrations. There are over 600 examples, totalling 24 000 lines of code, bundled with the book. More importantly, as the book was authored by three creators of the Java technology, you can be certain that the code is not only technically correct, but operationally robust.

The examples not only provide help to the reader in puzzling the intricacies of good Java code, they also offer 'real-world' solutions to common programming challenges. For example, the book offers complete code for file manipulation, network communications, file compression and streams, to name but a few.

To me, this is one of the text's strengths. The examples helped to clarify the text, as well as solve several immediate programming problems.

In summary, I heartily recommend this book to all serious Java developers, as well as to those who have not yet obtained an API reference text. Having said that, even those who currently have other API reference titles in their library would do well to at least consider this book.

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ATM: THE NEW PARADIGM FOR INTERNET, INTRANET, AND RESIDENTIAL BROADBAND SERVICES

Kwok, Timothy
New Jersey: Prentice Hall, 1998
ISBN 0-13-107244-7
Hardcover

Reviewed by
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School of Mathematics, Physics, Computing and Electronics
Macquarie University

System administrators and programmers are routinely called upon to give 3-5 year funding projections of future technology upgrades and networked system development. This can prove extremely difficult in a climate where the technology required to fulfil the "wish list" of current Internet users has not yet been conceived.

This problem is often exacerbated by the fact that many books about Internet networking technology:

(a) are pretty much out of date by the time they reach the bookshelf (although the situation is improving with electronic publication)
(b) have a very limited life span in terms of their utility and application to the newer networking technologies as they develop; or
(c) are unintelligible to those involved in "rolling out" the technology or who bear responsibility for administrative and financial decisions about intranet and external networking development.

Fortunately, Timothy Kwok's new book, on asynchronous transfer mode (ATM) for broadband integrated service digital networking (B-ISDN), not only provides an up-to-date and very readable introduction to the technical basis of broadband residential/business packet switching technology, it also presents the kinds of strategic justifications for major network upgrades that are not easily explained to those not directly involved in technology development (beyond the obvious incremental improvements in download times for what Kwok aptly terms the "World Wide Wait").

Predicting the future structure of the Internet and its transmission technologies has not always been trivial, as the current demand for tele-conferencing between physically distant sites attests. Kwok's arguments for adopting ATM-based technology as a standard for the foreseeable future are convincing. He (correctly) places a great deal of emphasis on developing efficient network protocols based on application requirements, and which ensure a minimum quality of service to users based on error minimisation at the application, network and physical layers. Kwok asks not only what the current physical technologies for distributed systems are capable of delivering, but also what they should be expected to deliver, from a user's point of view, within the very near future.

This is not to say that Kwok's work is concerned only with deployment strategies or the networking requirements of future multimedia applications. He devotes six chapters to a technically-thorough description of basic ATM principles, such as fast packet switching and virtual channel connections, as well as detailing the structure of the protocol reference model for ATM networks, and investigating the possibilities for supporting IP over ATM networks. The book also discusses the current state of subscriber networks, and how they might migrate from the existing ISP infrastructure, and reviews ATM's potential applications in telecommuting and interactive television, which although constrained by low-bandwidth technologies - are already growing in popularity.

Kwok's book will be a valuable addition to the libraries of three main audiences: system administrators who wish to develop forward-looking strategies for the implementation of the new ATM technology; multimedia programmers who are keen to translate current low-bandwidth networked applications to high-bandwidth multimedia delivery systems; and individuals in organisations that are becoming increasingly dependent on networked information technology. As such, it is a comprehensive and very readable introduction to "the new paradigm" of distributed information technology.

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AUUG Local Chapter Meetings 1998

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BRISBANE	25 August 29 September 27 October 24 November	Inn on the Park 507 Coronation Drive Toowong	For further information, contact the QAUUG Executive Committee via email (qauug-exec@auug.org.au). The technologically deprived can contact Rick Stevenson on (07) 5578-8933. To subscribe to the QAUUG announcements mailing list, please send an e-mail message to: <majordomo@auug.org.au> containing the message "subscribe qauug <e-mail address>" in the e-mail body.
CANBERRA	11 August 8 September 13 October 10 November 8 December	Australian National University	
HOBART	Each month, although dates can vary. Often will fit in with the schedule of a speaker should one be available.	University of Tasmania	
MELBOURNE	19 August 21 October 18 November 16 December	Various. For updated information See: http://www.vic.auug.org.au/auugvic/av_meetings.html	The meetings alternate between Technical presentations in the odd numbered months and purely social occasions in the even numbered months. Some attempt is made to fit other AUUG activities into the schedule with minimum disruption.
PERTH	19 August 21 October 18 November 16 December	The Victoria League 276 Onslow Road Shenton Park	Meeting commences at 6.15pm
SYDNEY	20 August 15 October 19 November 17 December	The Wesley Centre Pitt Street Sydney 2000	The February meeting will be replaced by the summer conference on 21 February.

*** All dates are subject to change.**
Up-to-date information is available by calling AUUG on 1-800-625-655.

Chapter News:

Canberra

AUUG Canberra Chapter
1998 Annual General Meeting
8pm Tuesday 11th August
Rm LG102, John Dedman Building, ANU

Agenda

1. Confirmation of minutes of last AGM Minutes are on-line at:

http://www.canb.auug.org.au/cauug/minutes/agm97.html

2. Presidents Report

3. Secretaries Report

4. Treasurers Report

5. Participation in The Internet Project (see note 2 below) Motion: That AUUG Canberra should terminate from its agreement with PCUG (ACT) Inc. regarding The Internet Project.

Moved: P. Wishart/J. Bishop

6. Election of Officers and Committee

7. Any Other Business

Notes:

1. Membership Card

Please be sure to bring your membership card so that we can be sure that your vote will be counted.

2. AUUG Considering withdrawal from TIP

The AUUG Canberra Chapter is thinking of terminating its relationship with PC Users Group (ACT) Inc. (PCUG) over the operation of The Internet Project (TIP). This has been precipitated because the chapter committee feels that a disproportionate amount of our volunteer effort goes into TIP. This is affecting our ability, enthusiasm and energy in other activities (eg. general meetings and workshops). Our primary concern is about the financial and management overheads, which consume time of chapter committee (esp. office bearers) with relatively little return to the chapter. The technical input (admin functions on the servers etc) is supported by a number of enthusiastic individuals and is seen as less of any issue since those individuals get something out of their technical involvement. However the financial and management aspects have been imposing an increasing load due to changes in the way that TIP needs top operate. It should be noted that PCUG are trying to manage a revenue flow of several hundred thousand a year, whereas AUUG's cash through TIP is bared several thousand a year. The PCUG's needs for much greater financial controls and accounting is putting increasing work on AUUG Canberra to match our equal partner status in the venture. We would like to see TIP continue and believe that PCUG should take it over. They are by far the dominant partner in terms of members and cash flow (PCUG 98% to AUUG 2%).

When TIP was created in 1994 by AUUG and PCUG there were far less options available for members in Canberra wanting Internet access. Today the range and variety of options and services for Internet access is much greater and there are many competitive alternatives available to everyone. The chapter committee does not believe that AUUG should be in the business of providing Internet services to members when there are viable and affordable alternatives available in the marketplace. Since TIP has been a major activity for the chapter the chapter committee wants to solicit the view of the chapter membership on this important issue. Our general meetings are held in Room LG102, John Dedman Building, ANU.

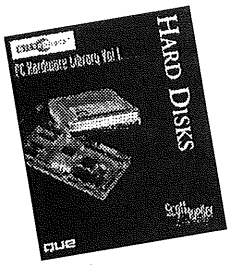
From Barry Drive, drive down Kingsley St, past Toad Hall (student college) on your right. Take a right after going past the Drill Hall gallery (this is just after having passed Hutton St on your left). Follow the road 20-30m until you are next to the car park. Directly next to car park is the John Dedman Building which is 4 stories high.

Alternatively, look for the Dedman building next to the Teaching and Learning Technology Support Unit (TLTSU) in the map at:

http://tltsu.anu.edu.au/TLTSU_location.html

❖

AUGUST BOOK CLUB AND PRENTICE HALL AUSTRALIA



☐ **PC Hardware Library -**
Volume I, II, and III
The Scott Mueller Library
0789716623 ~~$219.95~~ $175.95

Vol 1 - Hard Disks Identify drives and verify parameters for the BIOS, low-level formating, and partitioning in newer IDE and SCSI systems and much more.

Vol II - Network Interface Cards and Modems

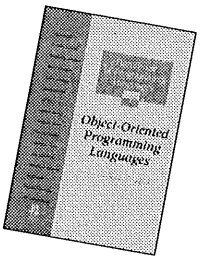
Use NIC disgrams to install and configure NIC's. Troubleshoot to find LED codes.Configure, troubleshoot and optimise modems and ISDN adapters with extensive tables listing AT commands, diagnostic LED interpretations, S-registers and more.

Vol III - Motherboards

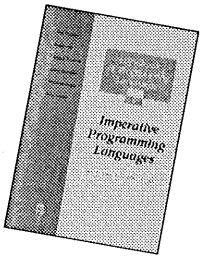
Use the motherboard diagrams and tables of pin and connector location, table of default settings,supported memory configurations and on board connectors to install, configure and troubleshoot any of over 100 common motherboards.

Handbook of Programming Languages
Editor: Peter H Saules

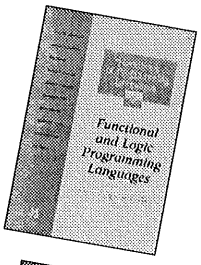
☐ **Object-Oriented Programming Languages**
1578700086 ~~$69.95~~ $55.95
This definitive reference explains the history of each language, its syntax and semantics; gives how to information and points out potential traps.



☐ **Imperative Programming Languages**
1578700094 ~~$69.95~~ $55.95
This volume covers the four most important imperative languages: fortran; C; Turbo Pascall and Icon.

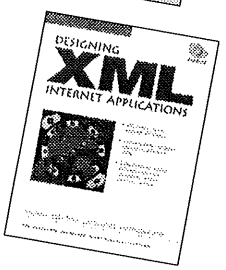


☐ **Functional and Logic Programming Languages**
1578700116 ~~$59.95~~ $47.95
This volume begins with the functional programing group all descended from John McCarthy's LISP of the late 1960's. It starts with a few pages from the LSIP 1.5 programmers manual, a vital indicator of things to come and moves on to discuss LISP's offspring: Emacs Lisp, Scheme, Guille and CLOS



☐ **Designing XML Internet Applications**
M Leventhal; D Lewis and M Fuchs
0136168221 ~~$79.95~~ $63.95

This is the first complete guide to building XML Internet applications that can automate and simplyfy virtually every form of electronic communication. Learn why your organisation needs XML, its usage and design and its real world processes.



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AUUG898

UNIX Traps & Tricks

Sub-Editor: Matthew Dawson
<dawson.matthew.ms@bhp.com.au>

Hi Everyone! Welcome to another edition of UNIX Tricks & Traps - the column designed to provide insights into how your fellow AUUG members make their day-to-day usage of UNIX easier.

This issue contains two more alternate implementation's of David Purdue's tidypath tip published in a previous issue. I wonder whether David realised that his submission would create this much 'controversy' when he first drafted it? If nothing else he has single-handedly proven that people do read this column...

The other contributions are a caveat for last issue's careful copy tip, and a log cleanup utility I wrote partly as a learning exercise.

And now for the community services announcement - if you have any UNIX Tricks and/or Traps that you would like to share with the nation, please send them in. Submissions have been fairly sparse of late and I'm quickly running out of material that I can use to 'pad out' the column. Unless more of you send in your pearls of wisdom I will be hard pressed to improve, or even maintain, the quality of this column's content.

❖

TIDYPATH: THE NEXT GENERATION

In a previous issue of UT&T David Purdue provided a C program to tidy out-of-control PATH variables. It achieved this by pruning all bar the first instance of directories, which had been listed multiple times.

At the end of his commentary he made an off-the-cuff comment that there must be a simple way to do this in either a shell or PERL script. Many of you decided to prove him right.

This issue contains two more examples of how to perform this same task in a 'pure' shell script. Both demonstrate the flexibility and power of the unaided Bourne shell.

Bourne
From: Jason Tyler <jason@itntl.bhp.com.au>

I was surprised to see the number of tidypath scripts in this month's [May 98's issue - Matt] column which use external programs, when the shell is capable of doing virtually all the work itself. My profile contains something like:

```
setpath () {
        n=
        p=$1
        shift
        for i
        do
                test -d $i || continue
                case "$n" in
                        $i|$i:*|*:$i:*|*:$i)        ;;
                        "")     n=$i;;
                        *)      n=$i:$n;;
                esac
        done
        eval $p=$n
        unset n p
}
setpath PATH . /usr/ucb /and_so_on... `echo $PATH | tr : \ ` $HOME/.bin
```

which prunes duplicate and nonexistent directories, while also adding some useful directories.

A challenge for next month: enhance this so that it detects linked directories (e.g., /bin and /usr/bin on Solaris machines) by comparing the inode and device major/minor numbers :-)

❖

Bourne Again
From: Andrew Cagney <cagney@tpgi.com.au>

Oh no, not another tidypath. ☺

```
#!/bin/sh
# Just in case someone tries to run it that way.
# Examples:
#       $ ( PATH= ; source ~/bin/tidypath ; echo $PATH )
#       Usage: PATH=.... ; source tidypath ; $PATH
#
#       $ ( PATH=a:b:a:a:/bin ; source ~/bin/tidypath ; echo $PATH )
#       a:b:/bin

case "${PATH}" in
  "" ) # often echo is a builtin
       /bin/echo "Usage: PATH=.... ; source tidypath ; echo \$PATH"
       exit 1
       ;;
esac

OIFS=$IFS
IFS=:

set - ${PATH}
PATH=$1
shift

for i
do
  #echo "${i}" "${PATH}"
  case "${PATH}" in
    *":${i}:"* ) ;;
      "${i}:"* ) ;;
    *":${i}"   ) ;;
      "${i}"   ) ;;
    * ) PATH="${PATH}:${i}" ;;
  esac
done

IFS=OIFS
```

❖

CAREFUL COPY: CAVEAT

In the last issue of UT&T, David Bell suggested that we should add a trailing slash (/) to directory names when supplying them as arguments to commands. This simple technique should stop us from, say, moving multiple files to a single filename rather than another directory as intended.

From: Matthew Green <mrg@eterna.com.au>

I noticed a problem with the "Careful Copy" article. Basically, there are OS's now that will strip the trailing slash from a directory name, so it doesn't matter if you have added it to the command or not. Solaris 2.6 is one of these OS's. :(

I believe it is actually a 'POSIX thing' that causes this.

❖

CLEANLOG

From: Matthew Dawson

There comes a stage in every system's life when it is necessary to automate the clean up of left-over files. Now this need can be satisfied using multiple purpose-built scripts, but taking this path creates a maintenance headache in the long term. Most system administrators will find it is worth the pain of writing one script that can service all of your file clean up needs. This is my version of that 'Swiss army knife' utility.

When I started to develop this script I had a few aims. The first, surprise surprise, was to create a script that detected whether a file should be cleaned (by age, size or number of matching files) and perform the desired action on those files (delete, move to a new name or compress). While these actions/detection methods are fairly simplistic, you can usually satisfy your cleanup needs by processing a file multiple times (e.g. renaming a file based on age or size, and then deleting the oldest renamed file(s) if there are too many).

The next was to make the script fairly portable. The usefulness of this cleanlog is greatly reduced if I need to port it to each UNIX variant I want to use it on. In an attempt to highlight any portability issues I developed/tested it on AIX v3.2.5, Linux (Slackware, v2.something) and Windows 95 (using Cygnus's 32-bit port of sh and the necessary GNU tools). I'm sure there will be issues not found on these platforms, but these were enough to cover my immediate needs.

The last aim was to learn more about shell programming. To this end I wrote cleanlog using pure Bourne shell rather than resorting to awk as I have done previously. Once again I'm sure that I could have written more of the script using Bourne's built-in functionality, instead of relying on the various common GNU utilities, but that would have meant reading through manuals and I just didn't have the energy...

Anyway, enough rambling. If you want a copy of the script or wish to make a comment about it, feel free to send me an email. But be warned - I will consider all UT&T related correspondence as potential submissions unless you specifically request otherwise.

```
#!/bin/sh
#
# Copyright (c) 1998 Matthew Dawson <mattd@auug.org.au>
#
# @(#) cleanlog.sh: Cleans up files, based on the rules specified in the config file.
#
#     Usage:
#       cleanlog.sh [-c cfgfile] [-l logfile] [-n]
#     where
#       -c cfgfile  Specifies the config file to use (default = ./cleanlog.cfg).
#       -l logfile  All output will be logged to this file.
#       -n          No output will be displayed by this script.
#
# Config file's line format:
#   <Dir> <File spec> <Action> <Condition> <Modifier>
#
#    <Dir> - Directory containing the log file
#    <File spec> - find compatible file specification (wildcards allowable)
#    <Action> - Action to perform on files which match the file spec and
#               cleanup method.
#      DELETE - Deletes files the files.
#       RENAME - Renames each file, appending a date/time stamp to the filename.
#       COMPRESS - Compresses each individual file using gzip.
#       COMPRESSALL - Tar's all matching files, then compresses the result.
#    <Condition> - Files which match the file spec and the following condition
#                  will be 'cleaned up'.
#       AGE - Files were created more than <modifier> days ago.
#       CNT - More than <modifier> files match this file spec.  The oldest files
#             (based on creation date) will be cleaned.
#       SIZEKB - Files larger than <modifier> Kb.
#       SIZEMB - Files larger than <modifier> Mb.
#
# Note: Avoided the -maxdepth x and -size x[kw] flags of the find command
#       because some UNIX variants (particularly AIX) do not support them.
#
# Known Issues:
#   Assumes that gzip is installed and can be located by the PATH.
#   Various commands (particularly rm's) should use xargs to guard against too
#   many arguments being passed to the command.
#

#
# Performs the specified actions on the files to be cleaned.
# Args: <Dir> <File spec> <Action> <File1> [... <Filen>]
#
perform_actions()
{
```

```
  IFS=$orig_IFS                                    # Reset the field separators.
  date_time=`date +"%Y%m%d%H%M%S"`                 # Date/time stamp to add to files.

  if [ $# -lt 3 ]                                  # Abort if insufficient arguments.
  then
    echo No files to process \($*\)
    continue
  fi

  directory="$1"
  shift
  file_spec="$1"
  shift
  action="$1"
  shift

  case $action in
    DELETE|Delete|delete)
      rm -f $*
      ;;
    RENAME|Rename|rename)
      for current_file in $*
      do
        mv $current_file $current_file.$date_time
      done
      ;;
    COMPRESS|Compress|compress)
      for current_file in $*
      do
        gzip $current_file
      done
      ;;
    COMPRESSALL|Compressall|compressall)
      # Replace metacharacters in the file spec with underscores, then use the
      # result (with an appended date/time stamp) as the .tar file name.
      archive_base=`echo $file_spec | tr '\*\?\[\]' '___'`
      archive_name="$directory$archive_base.$date_time.tar"
      tar -cf $archive_name $*
      gzip $archive_name
      rm -f $*
      ;;
    *)
      echo Invalid action method \($action\)
  esac
} # perform_actions

#
# Main body of the script
#
cfg_file=./cleanlog.cfg                            # Default configuration file.

if [ $# -gt 0 ]
then
  set -- `getopt nN1:L:c:C: $*`

  if [ $? -ne 0 ]
  then
    echo Invalid arguments were passed!
    exit 1
  fi

  while [ $1 != -- ]
  do
    case $1 in
      -n|-N)                                       # No output to stdout.
        log_file=/dev/null;;
      -l|-L)                                   # Redirect stdout to this file.
        shift
        log_file="$1";;
      -c|-C)                                       # Use this config file.
        shift
```

```
        cfg_file="$1";;
    esac
    shift
  done
fi # if arguments supplied

if [ -n "$log_file" ]   # Setup the log file, or exit the script if its invalid.
then
  touch $log_file
  if [ $? -ne 0 ]
  then
    echo \"$log_file\" is not a valid log file!
    exit 1
  else
    exec > $log_file 2>&1          # Redirect stdout and stderr to the log file.
  fi
fi # if log file is to be used.

echo cleanlog started at `date`.

if [ -z "$cfg_file" -o ! -f "$cfg_file" -o ! -r "$cfg_file" ]
then
  echo \"$cfg_file\" is not a valid config file!
  exit 1
fi

# Store the original IFS, and then set IFS to contain a newline character only.
orig_IFS=$IFS
IFS="
"
set -f                                          # Don't interpret metacharacters.

for config_line in `cat $cfg_file`                  # Read each config file line.
do
  IFS="       "                          # Set IFS to space and tab characters only.
  unset output_files
  set -- $config_line

  if [ "$1" = '#' -o "$1" = ';' ]                          # Ignore comment lines.
  then
    continue
  else
    directory="$1"
  fi

  if [ -n "$2" ]
  then
    file="$2"
  else
    echo No file specified \($config_line\)
    continue
  fi

  if [ -n "$3" ]
  then
    action="$3"
  else
    echo No cleanup action specified \($config_line\)
    continue
  fi

  if [ -n "$4" ]
  then
    method="$4"
  else
    echo No cleanup method specified \($config_line\)
    continue
  fi

  if [ -n "$5" ]
  then
```

```
    modifier="$5"
  else
    echo No cleanup modifier specified \($config_line\)
    continue
  fi

  case "$method" in              # Check whether the specified condition is met.
    AGE|Age|age)
      output_files=`find "$directory" ! -name . -prune -a \
                    ! -type d -name "$file" -ctime +"$modifier" -print`
      ;;
    CNT|Cnt|cnt)
      input_files=`find "$directory" ! -name . -prune -a \
                   ! -type d -name "$file" -print`
      if [ -n "$input_files" ]
      then
        no_files=`echo $input_files | wc -l`
        if [ -n "$no_files" -a "$no_files" -gt "$modifier" ]
        then
          IFS=$orig_IFS
          no_files_delete=`expr $no_files - $modifier`
          output_files=`ls -cr $input_files | tail -$no_files_delete`
        fi
      fi
      ;;
    SIZEMB|Sizemb|sizemb)
      actual_size=`expr $modifier \* 1024 \* 1024`
      output_files=`find "$directory" ! -name . -prune -a \
                    ! -type d -name "$file" -size +"$actual_size"c -print`
      ;;
    SIZEKB|Sizekb|sizekb)
      actual_size=`expr $modifier \* 1024`
      output_files=`find "$directory" ! -name . -prune -a \
                    ! -type d -name "$file" -size +"$actual_size"c -print`
      ;;
    *)
      echo Invalid cleanup method \($config_line\)
  esac

  if [ -z "$output_files" ]      # If no files were found, skip to the next line.
  then
    continue
  fi

  perform_actions "$directory" "$file" "$action" "$output_files"
done
```

❖

Notification of Change

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You can help us! If you have changed your mailing address, phone, title, or any other contact information, please keep us updated. Complete the following information and either fax it to the AUUG Membership Secretary on (02) 9332-4066 or post it to

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P.O. Box 366
Kensington, NSW 2033
Australia

(Please allow at least 4 weeks for the change of address to take effect..)

☐ The following changes are for my personal details, member #:_____

☐ The following changes are for our Institutional Member, primary contact.

☐ The following changes are for our Institutional Member, representative 1.

☐ The following changes are for our Institutional Member, representative 2.

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Application for Institutional Membership

Section A: MEMBER DETAILS

The primary contact holds the full member voting rights and two designated representatives will be given membership rates to AUUG activities including chapter activities. In addition to the primary and two representatives, additional representatives can be included at a rate of $70 each. Please attach a separate sheet with details of all representatives to be included with your membership.

NAME OF ORGANISATION: _____

Primary Contact

Surname _____ First Name _____

Title: _____ Position _____

Address _____

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Telephone: Business _____ Facsimile _____

Email _____ Local Chapter Preference _____

Section B: MEMBERSHIP INFORMATION

Renewal/New Institutional Membership of AUUG	☐	$350.00
Surcharge for International Air Mail	☐	$120.00
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Rates valid as at 07/96

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AUUG mailing lists are sometimes made available to vendors. Please indicate whether you wish your name to be included on these lists:

☐ Yes ☐ No

Section E: AGREEMENT

I/We agree that this membership will be subject to rules and by-laws of AUUG as in force from time to time, and that this membership will run from time of joining/renewal until the end of the calendar or financial year.

I/We understand that I/we will receive two copies of the AUUG newsletter, and may send two representatives to AUUG sponsored events at member rates, though I/we will have only one vote in AUUG elections, and other ballots as required.

Signed: _____

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Date: _____

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Surname _____ First Name _____

Title: _____ Position _____

Organisation _____

Address _____

Suburb _____ State _____ Postcode _____

Telephone: Business _____ Private _____

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Section B: MEMBERSHIP INFORMATION

Please indicate whether you require Student or Individual Membership by ticking the appropriate box.

RENEWAL/NEW INDIVIDUAL MEMBERSHIP

Renewal/New Membership of AUUG ☐ $100.00

RENEWAL/NEW STUDENT MEMBERSHIP

Renewal/New Membership of AUUG *(Please complete Section C)* ☐ $25.00

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Rates valid as at 07/96

Section C: STUDENT MEMBER CERTIFICATION

For those applying for Student Membership, this section is required to be completed by a member of the academic staff.

I hereby certify that the applicant on this form is a full time student and that the following details are correct.

NAME OF STUDENT: _____

INSTITUTION: _____

STUDENT NUMBER: _____

SIGNED: _____

NAME: _____

TITLE: _____

DATE: _____

Section D: LOCAL CHAPTER PREFERENCE

By default your closest local chapter will receive a percentage of your membership fee in support of local activities. Should you choose to elect another chapter to be the recipient please specify here:

_____

Section E: MAILING LISTS

AUUG mailing lists are sometimes made available to vendors. Please indicate whether you wish your name to be included on these lists:

☐ Yes ☐ No

Section F: PAYMENT

Cheques to be made payable to **AUUG Inc**
(Payment in Australian Dollars only)

For all overseas applications, a bank draft drawn on an Australian bank is required. Please do not send purchase orders.

-OR-

☐ Please debit my credit card for A$_____

☐ Bankcard ☐ Visa ☐ Mastercard

Name on Card _____

Card Number _____

Expiry Date _____

Signature _____

Please mail completed form with payment to:

Reply Paid 66
AUUG Membership Secretary
PO Box 366
KENSINGTON NSW 2033
AUSTRALIA

Or Fax to:

AUUG Inc
(02) 9332-4066

Section G: AGREEMENT

I agree that this membership will be subject to rules and by-laws of AUUG as in force from time to time, and that this membership will run from time of joining/renewal until the end of the calendar or financial year.

Signed: _____

Date: _____

AUUG Secretariat Use

Chq: bank _____ *bsb* _____

A/C: _____ *#* _____

Date: _____ *$* _____

Initial: _____ *Date Processed:* _____

Membership#: _____