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The Software Developers' Magazine

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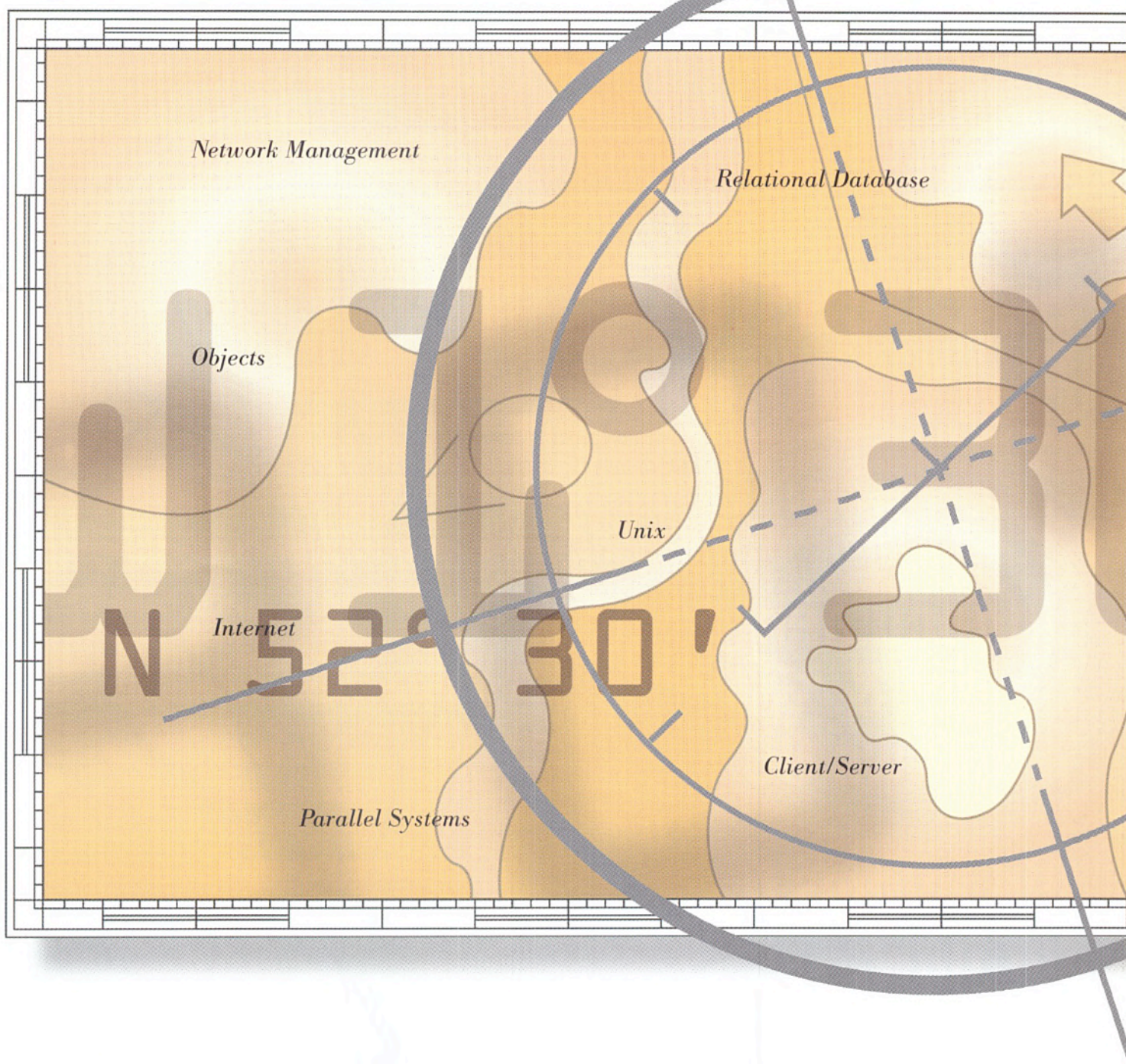
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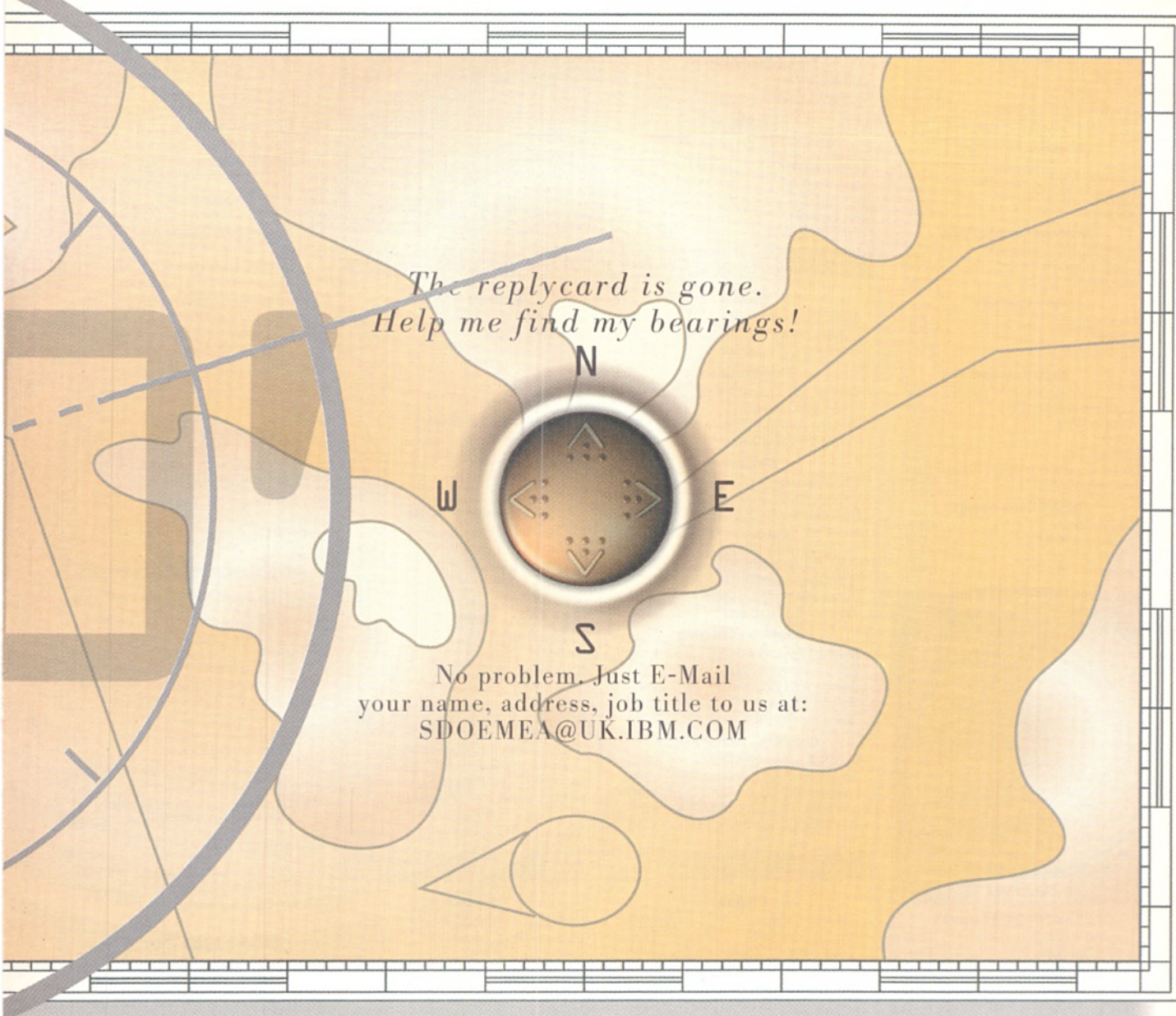




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The Complete C++/Java Tool?

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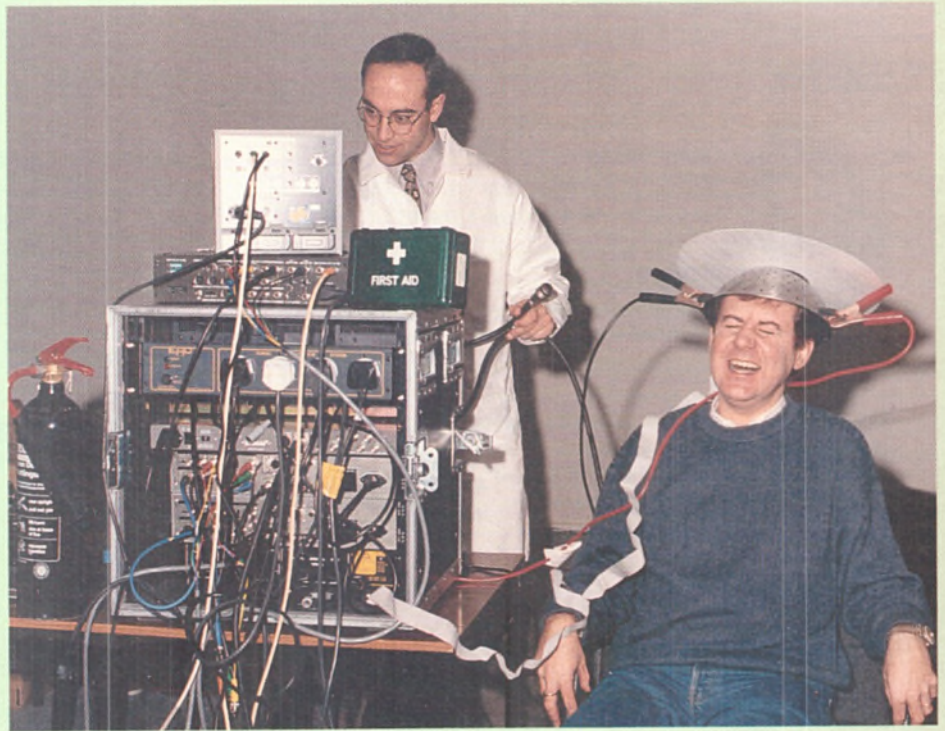
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How to really achieve software reuse

You talk about it. Dream about it. Try to get others to obsess over it. But just how much software component reuse do you really get?

Reuse is one of the reasons we all ran open-armed towards client/server. We were seduced by the common vendor refrain: 'Use our tool and you'll get *tons* of reuse. Faster development. Easier maintenance.' Well, friends, welcome to the Fake Plastic Oasis of software development. The sun has come out and it's time to shed a little light on the reuse bottom line.

Reuse has very, very little to do with tools. But it has almost everything to do with technique. In fact, both Gartner Group and Meta Group agree that only 5 to 10% of software developed gets reused across the enterprise. And that number must have been tricky to arrive at, since few companies have any degree of enterprise-wide, tracked, organised reuse plans in place. Sure, we reuse software components within a given team, but the amount of redundant coding that occurs across the enterprise is staggering. And it's not going to change until we change it.

Developers have no incentives that cause them to reuse code. They have no inexpensive, tool-independent repository. They have no infrastructure to make reuse easy. Sure we have some common dialogs and controls, but that's kid's stuff. To be truly macho, we need to reuse business rules, data objects, logic, GUI components (eg window layouts, icons, pushbutton labels), deliverable templates, processes and methods. Now we're talking!

Here's what you really need to make reuse happen:

1. An infrastructure coordinator (the person who supervises the following items).
2. An object reuse plan (standards for creating and testing each type of reusable object).
3. An object change control plan (guidelines for change impact analysis, testing the object in existing and new usage scenarios, and notification and distribution of changed objects).
4. An object librarian (who ensures objects are under version control, audits for standards compliance, and supervises object maintenance).
5. An object repository, or catalogue of available objects and pointers to where they reside (the cheapest way to do this is to create a help file browser which points to a reuse server).
6. Financial incentives for developers to build reusable components (based on the degree of reuse, which you can assess over time from a 'where used' report).
7. Time, money, management support and a healthy dissatisfaction with your current lack of reuse.

Yes, implementing the above is a hassle. But reuse doesn't happen without structure and communication. And the hassle is only short term. Once your reuse process is set up, you will rely on it for years with minimal maintenance. Developer discipline counts too, as does developer confidence with the whole process of reuse. It's harder *initially* to build objects for reuse, but once you get the hang of it, and everyone understands the standards, process and benefits, you'll be glad you bothered.

The best way to find reusable components is to get the object librarian and infrastructure coordinator to meet with the development team. Together they can identify the objects an application needs, whether they already exist, and then refer the developers to the repository or ensure the objects they build are as reusable as possible. Needless to say,



application-specific code does still exist. A reactive scenario is to locate reusable components in the post project review.

So let's stop talking and dreaming about reuse. Let's bite the bullet and do it. Drop me a line and tell me what you are reusing... or dream about reusing.

Christine Comaford is president of Corporate Computing, an LBMS subsidiary. She can be reached by fax (0171 878 8709) or via email at 74603.3664@compuserve.com.

Old standards, new standards

Do you remember 3270 emulation? Do you remember dumb terminals? Do you remember the time when all software was written by a central computer department? And more recently do you remember GeoWorks' Geos?

It's amazing how often one can hear all these terms at press conferences these days. And they are not evoked with nostalgia but as the way forward. Recently Sun presented to a happy few its future Java machine: a 'cheap' Java-ready computer. The biggest market targeted by Sun for the first iteration of these computers is as a replacement for 3270 terminals! Have you seen the sales argument for any Web-based product? More often than not, it just looks like a vaguely updated brochure for an IBM mainframe: thin client (read dumb terminal), computing happens centrally on the Web server (read mainframe)...

And Geos, once touted as a Windows alternative, IBM even considered it as a 'Presentation Manager Lite', is making a big comeback in PDAs. The latest Nokia communicator, an exciting mix between a phone and a palmtop planned for August, features Geos with newly developed software such as... a Web browser.

Doesn't anyone have any new ideas?

David Mery

Mayhem!

Is contracting an outsourcing company signing a pact with the Devil? That is **Jules'** opinion.

Programmers have a pretty hard time. Not only does a programmer have to write solid code (which is tough enough at the best of times), but he has to keep abreast of all the latest standards, protocols, and fashions. Not only is he aiming for moving goalposts, the goalposts are moving faster than most projects!

But if you think the programmer has it hard, spare a thought for the managers. Not only does a manager have to manage a team of whining programmers (which is tough enough at the best of times), but he has to keep abreast of all the latest legislation, good business theories, and services. He, too, is aiming for moving goalposts, but the goalposts are also aiming for him with very nasty grins on their faces!

I suppose it's understandable, then, that when facilities management, outsourcing, or whatever it is called this week is presented to him, it looks attractive. 'Let us take away your problems' say the outsourcing companies (I suppose they'd be called *insourcers*), 'and save you money': the manager thinks that it has to be a good deal. Me, I'm a bit suspicious of companies that promise everything I want, and it occurred to me to wonder how FM companies do it.

Here's how the deal works. Suppose you're a moderately successful, multinational company. You make widgets. That's your core business; it's what you know about, and what you're good at. But to attain even your modest level of success, you need to get involved in bookkeeping, accounts management, document tracking, in fact no end of paperwork. In order to facil-

itate this paperwork, you've bought a computer or two, and probably have most of a small town to put them in. But, you're only human, just like any multinational, and you resent having the computers, and you resent the millions of whatever currency best matches the wallpaper that you're spending on keeping it all running. Most of all, you resent the programmers for showing up late in jeans.

So, you make a pact with the FM company. They buy all your computers off you for reasonable second-hand rates (ie scrap value). They take over all your computer department contracts (except one or two, because somebody in your firm needs to know what's going on), and they leave everything exactly where it is. Then they send their own people in to find out how it's working now.

Some of your staff will object to the new dress code, or the lack of overtime pay, or the morning prayer ceremony, and will leave. Existing company people will be sent in to take their places. Those company people will suss out who knows their stuff and so should be deployed in troubleshooting roles at other sites run by the FM company; who knows nothing and so should be re-assigned to traineeships at the FM company head office; and who is a waste of oxygen and should be consigned to the DSS. Every time someone moves on, another company man is re-assigned to take his place.

Now, these new staff are skilled, educated, experienced people. They cast a fresh eye over the entire operation, and can identify, with barely a moments thought, where inefficiencies lie. They will recommend that certain parts of the operation be moved off-site into a centralised facility, where all cus-

tomers can get the benefit of the spectacular equipment which is installed there. They will recommend that other parts be retired, and replaced with newer, better equipment, which the FM company's immense buying power is able to acquire comparatively cheaply (but the cost of which will rise as the buying department, the specification department, the support department and the transport department all make their contribution - £2,500 for a 386, anyone?) Finally, they will recommend which parts of the operation have nothing wrong with them, so should be relocated to one of the facility sites in order to spread the benefit among all the customers.

You, remember, are a moderately successful



multinational. How do you feel when you see these men in blue suits and 'Have a nice day' smiles sack or steal your staff, scrap or steal your equipment, and decimate your entire computer operation, the underpinning of your own, moderate (but very worthwhile) success? How do you feel when you realise that never again will anything in your organisation be truly confidential? Actually, you should feel pretty good. You're getting a far better service than you ever had before, and it's costing you less.

Ah, yes. The cost. You've negotiated a fee for the FM company to run your operation for you, but of course, the operation has been dismantled. All this extra work doesn't come free, you know. You have to pay for this new equipment (at whatever cost the FM company asks for), you have to pay for the staff who fit it (ditto), and who know what to fit (ditto again), and even those who take the old stuff away to the scrap dealers where (you are assured) it belongs (more ditto). The central services which you use

must, of course, be paid for. If you worry about the escalating costs, you can always call an expert at the FM company, who will take as much time as you need out of his busy schedule to explain exactly why you must pay all this money. You won't have to pay for *his* time right away – the end of the month is fine.

Contracts don't run forever, of course. After five years, perhaps ten, the contract expires, and you're free. You can spend your money the way you want. You can buy your



own computers (you might even be able to buy the computers you've been using during the contract, if the FM company doesn't want them), you can hire a new team and new managers, and you can start again from scratch. Of course, the first thing they will have to do is to clear the backlog of work that's built up while you're rebuilding your company's heart. It's probably easier just to renew.

Why would anybody in their right mind get involved with such a deal? Plenty of people do. There's no point tying up a wonderful contract, because you'd be busted a hundred times over before you got to sue if they let you down really badly. The only explanation I can think of is trust. Someone who hires an FM company must feel able to trust them absolutely, for far longer than the foreseeable future, because an FM contract is a permanent arrangement.

It's a nice thought, isn't it, that such trust still exists in the world, and it's an even nicer thought that it exists in big business. For my part, I couldn't trust any company that much, and as a facilities manager at a reasonably successful multinational, I don't think I'd dream of recommending such a course to the board, no matter how much money it appeared to save.

It's a hard life, being a computer facility manager. I'm glad I'm a programmer. ■

Jules still writes programs. He can be contacted on 01707 662698, or on Cix as jules@cix.compulink.co.uk. If you work in the sales office of an FM company, there's really no point calling.

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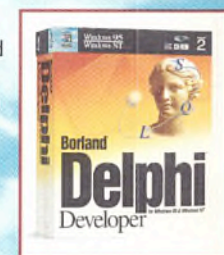
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Café to stand alone

Symantec has announced a standalone version of its Café Java development system, entitled Symantec Café for Windows. The first version of Café, also known by its code-name Espresso, was a patch to the existing Symantec C++ 7.2 compiler, but this new version is a development environment by itself. The new compiler will build both full applications and Web-page applets. Symantec claims that the new native compiler produces code several times faster than when generated with the original SunSoft development kit.

The new Café features an integrated graphical source-level Java debugger capable of working with fully compiled applications, and applets integrated into Web pages. The 'Café Studio' environment allows for visual editing and design of forms using drag and drop. All the development environment features of Symantec C++, including syntax highlighting, Wizards, etc are available within the Studio. A Java Class Browser is included, along with version 1.0 of the Java Development Kit (JDK) from Sun. Symantec has also included a replacement for the Sun Java interpreter DLL which it claims is 'considerably faster' than the original.

Café will initially be available for Windows 95 and NT, with a Macintosh version to follow. Officially available 'late March', Café will have an RRP of £289, or for existing Symantec C++ users, £79 if bought through Silicon River. Espresso users who registered Symantec C++ 7.2 between December 1, 1995 and March 1, 1996 will be entitled to a free copy of the new product. Symantec plans to issue free updates to registered users over its Website.

♦ Call Symantec on 01628 592242, and ♦ Silicon River on 0181 317 7777 for details of the upgrade offer.



Intel promotes MMX as future of multimedia

Intel has released details of its MMX multimedia extensions to the Pentium instruction set. Although not yet available on any production Intel processors, MMX is expected to arrive before the end of the year and to be in wide use by 1997. To this end, Intel is encouraging developers of multimedia applications to start supporting the technology in their software now.

MMX is pitched mostly at the home multimedia market, where games and graphics-intensive entertainment applications dominate, and at the Internet, where projected applications include on-line video-conferencing. These are the areas where Intel sees MMX being of most use. Several companies including Macromedia, IBM and NuMega have announced support for MMX in forthcoming products, while Microsoft has pledged to incorporate MMX into Visual C++ as soon as possible, as well as to MMX-enable the DirectX and ActionX series of APIs.

MMX works on the principle of Single Instruction Multiple Data (SIMD); essentially, this allows for various processor-intensive operations based around loops to be implemented using a single instruction. Pentium-class processors can then get on to executing another of the instructions in the pipeline, saving many clock cycles. A programmers reference manual for MMX technology is available for downloading from Intel's World Wide Web site.

♦ Intel: 01793 403000 ♦ Fax 01793 430763

♦ URL <http://www.intel.com/pc-supp/multimed/mmx/index.htm>

Direct3D and ActiveMovie in beta

The latest addition to the DirectX family of 'high performance' APIs, Direct3D, has been released by Microsoft as a beta SDK, available to developers now. Direct3D is based on the Reality Lab 3D product from Microsoft-owned RenderMorphics. The team at Redmond has packaged the code into a DirectX-compatible API aimed fairly and squarely at developers of games and virtual reality applications. It is designed to work in software alone, or transparently with any hardware accelerators which may be present. Features include the ability to map textures or video onto 3D objects, scene management services, and a standard set of object animation features.

ActiveMovie is Microsoft's new digital video technology. ActiveMovie is an MPEG system, designed to play back data streams at the highest quality possible with the software or hardware present on a PC. Microsoft claims that full-screen playback of MPEG-1 encoded movies with 11 KHz stereo sound is possible on a Pentium 90 in software only. The system provides a framework for video 'filters' to be added at playback time, allowing the PC to make new material out of stock footage. ActiveMovie will play back real-time MPEG streams delivered over an Internet connection, and is to be incorporated into future Microsoft Internet Explorer releases. A beta SDK is available including an ActiveMovie OCX.

Microsoft says that DirectX and ActiveX APIs will support Intel's MMX when available. There will be versions for Windows 95, NT, and Macintosh platforms.

♦ For more information contact Microsoft on 01734 270001 ♦ Fax 01734 270002

Protek announces the launch of the XRT/Gear collection of widgets for Motif developers.

Six widgets are bundled including Tab Manager, Toolbar, Enhanced Toggle, and Pushbutton. A single-developer license costs £1,495. Protek:

01628 75959 email: steager@protek.co.uk

From SSA Object Technology comes Newi Solo, a 'business object' starter kit for developers.

This 'high-level' approach reduces training time and increases productivity. Newi Solo for Microsoft Windows is priced at £495. SSA is on 01635 522600

Helping Hand for VB 3.0 and 4.0, from Keylink Computers, is a help authoring tool with a difference. Help text is written into the VB source incorporating special control codes, the software then extracts the text and builds the final help file. Available for Windows 3.1 & 95, price £149.95. Keylink: 01926 850909, fax 01926 864128

Object Design has released ObjectStore OpenAccess, an SQL access tool for its ObjectStore OODBMS. OpenAccess gives developers the best of both worlds: OO database technology combined with familiar SQL (and ODBC) tools. Object Design (UK): 01344 458200

Menai Corporation's cross-platform I/O library for Internet developers, Gamelon, has been ported to the Solaris operating system. Gamelon already supports Windows 3.x, 95, and NT, plus OS/2 Warp. A Mac version is planned. Menai Corporation: (+1) 415 853 6450

ComponentSource has just released Issue 1 of the **ComponentSource CD**, a selection of Visual Basic components. The components can be unlocked by telephone with a credit card. Issue 1 is free with future discs available by subscription. Contact ComponentSource on **01734 581111**

From **Stilo Technology** comes the **Stilo SGML Document Generator**, an SGML/HTML authoring tool featuring graphical editing and integrated outliner. Available initially for the Macintosh, with Windows 95 and NT versions in May. Stilo is on **01222 483530**, e-mail: **info@stilo.demon.co.uk**

Silicon River has **The C++ Foundation Video Training Course** and the **Advanced C++ Video Training** courses covering all elements of the language. Price £199.95 for the personal edition. Contact Silicon River on **0181 317 7777**

Vmark Software has announced a 32-bit version of its **UniVerse Objects OCX** client/server tool, which allows Windows clients to access UniVerse database servers on Unix as well as NT at an abstract 'business object' level. Vmark: **01344 355500**

Synoptics has launched **Image Objects (Io)**, a set of OCXs designed to process images. The range of processing functions includes Fourier Transforms and various morphing effects. These can be dropped into any OLE enabled development tool including Visual Basic. Synoptics: **01223 423223** Fax: **01223 420020**

JFactory set to zApp competition

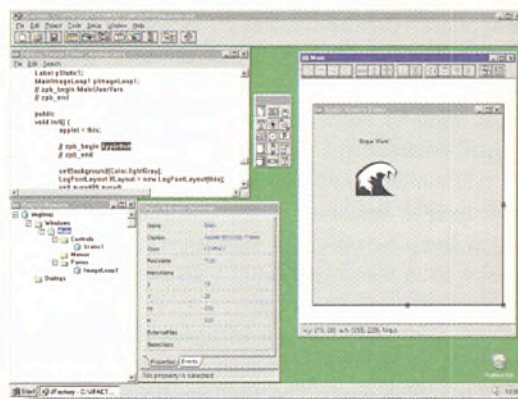
Rogue Wave has brought out JFactory, a Java visual development tool and code generator. Using JFactory, developers can create Java applications through drag-and-drop; controls can be visually laid out, enabling the rapid creation of complex user interfaces. With rivals such as Symantec's standalone Café and Borland C++ 5.0 waiting in the wings, JFactory might seem like an untried technology, but beneath the Java-enabled front end lies the core of zApp Factory, Rogue Wave's long-standing cross-platform development system. The existing zApp technology lends itself well to Java which is inherently multi-platform.

In the best object-oriented traditions, JFactory has inherited the functionality of zApp Factory, carrying over much of the existing code base and providing Java programmers with a comprehensive and tested set of basic functions, reducing development time. JFactory builds stand-alone Java applications, as well as applets for use in Web pages.

The JFactory visual environment follows the Visual Basic and Delphi trend with a form designer and control palette, property sheets, and project manager. As with VB, writing a Java application should be as simple as dropping a control on your form, setting the properties, and writing the handling code. Provision has been made for adding user-written objects to the existing Object Library, and the dialog editor is capable of importing Windows .rc and .dlg resource files, allowing developers to re-use existing work as far as possible.

JFactory will face stiff competition from some rival Java development systems, especially Borland C++ 5.0 which has a long track record and considerable support within the developer community. JFactory supports a range of platforms: Windows 95, NT, and Sun Solaris. Available now, the price is £636.

► For UK information, contact Hypersoft Europe on 01273 834555.



Lotus Components at Windows Show 96

Lotus chose the Windows '96 Show at Olympia for the first UK demonstration of its new Notes-enhancing technology, Lotus Components. Designed to integrate into Notes release 4, and available 'midyear', the Components give users quick and easy access to commonly-used tools such as spreadsheets and graphics. Components, based on 32-bit OCX technology, are small in size and load quickly, and can be used within other applications as OCXs, but only have full functionality with the application they have been written for, in this case Notes. The extra code allows the Components to hook into proprietary Lotus features such as the InfoBox and SmartIcons.

The Lotus Components Development Kit will include tools for converting existing OCXs into Lotus Components, and header files, classes and DLLs for writing them from scratch in C++. Components can be controlled by both LotusScript and VB Script, and it will be possible to adapt the supplied Components and create new custom types without the need for further programming.

Initially, Lotus Components will only target Notes release 4 as a container, but Lotus has plans to extend this to SmartSuite '96 and is looking at other potential containers. Lotus Components will be 32-bit only; Lotus does not consider 16-bit OCXs to be a sufficiently viable technology. Larry Roschfield, senior director of application product management and design at Lotus, confirmed that OLE2 was chosen as the base object structure for the product because it is the only one currently commercially available, but said that versions based on OpenDoc for OS/2 and UNIX were under development, and that a Java-based version will be forthcoming.

Pricing for the Lotus Components development kit will be £552, or £312 for developers buying under the Lotus Passport program. The Lotus Components Starter Pack will cost £39 per user.

► Contact Lotus on (01784) 455445 ► Fax (01784) 445618.

Apple announces WWDC '96

Apple Computer has announced plans for the 1996 Worldwide Developers Conference (WWDC) to be held at the San Jose Convention Centre between May 13 and 17. This year's event will centre around Copland, the beta of the next-generation MacOS, which will be released to developers at the conference. Other areas of attention will be OpenDoc and Newton, with emphasis on communications and multimedia. The effect of the Internet on developers and the issue of cross-platform development, which is becoming increasingly important, are to be covered in depth during conference sessions.

► Apple Computer: 0800 127753 ► URL <http://www.apple.com>

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National Instruments has announced **Component Works**, a collection of OCXs including modules for controlling a variety of industrial instruments, along with controls for displaying the data in VB applications. Call **01635 572511**

From **Select Software Tools** comes **OMT Professional Workbench 5.0**. New features include automatic diagram construction, enhanced code generation and better method support. Select is on **01242 229700**

Microware has announced **FasTrak 2.0**, a development tool for the OS-9 Real-time operating system. The new version includes debugging and analysis functions for C and C++ code, and support for 68060, PowerPC and Pentium. Contact Microware on **01628 667578**

Powersoft has made alpha versions of its **media.splash** technology available for downloading. Media.splash brings multimedia, and database access to Web pages, and features a point and click interface. For more info, call Sybase on **01628 597100** or <http://www.sybase.com>

Versit has released the **Versit CTI Encyclopedia**, a framework for cross-platform Computer Telephony Integration. The Encyclopedia includes a single open API which Versit hopes that developers will help make a genuine standard. You can download a copy from <http://www.versit.com>, or ask for the CD-ROM version by faxing **00 49 89 722 31395**

Outsourcing clients look for better deal

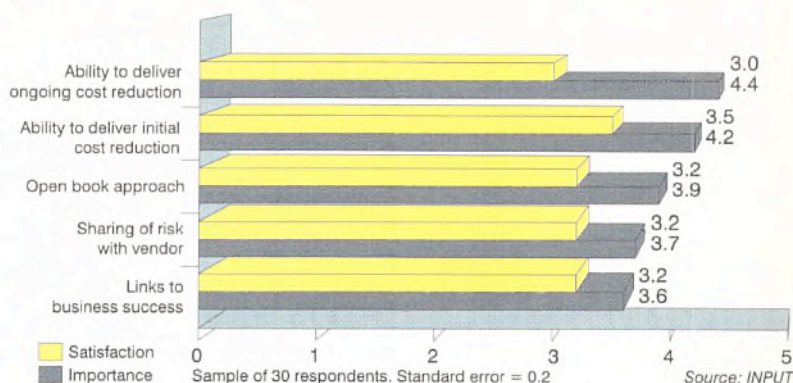
Recent research by IT consultants Input shows that companies who rely on outsourcing for their IT requirements typically do not feel they are getting value for money from vendors. They expect vendors to provide complete and innovative solutions while also

increasing value for money over time. The key factor identified by the research is that after a few years, clients come to feel that the vendor is not making sufficient effort to sustain the increase in cost savings.

There are some alarming figures for vendors: 55% of those outsourcing clients interviewed had renegotiated their initial contract. In the majority of these cases, clients had won a reduction in the contract price. The report identifies typical areas of significant difference between vendor and client perspectives, in particular on the issue of penalties and incentives. Clients increasingly feel that vendors should be happy to accept penalty clauses and not expect any incentives other than the eventual prospect of contract renewal. Vendors, on the other hand, resent penalty clauses which they feel show a distrust in their ability to provide a service, and believe that incentives are justified where project targets have been achieved and even exceeded.

There is also a difference of opinion on the topic of innovation, which software developers in this market typically consider to be high-risk and consequently worthy of extra investment by the clients. Clients, however, expect such innovation to be an inbuilt part of the package. The report is titled *Pricing Mechanisms in Information Systems Outsourcing - Europe, 1995*.

► Contact John Wilmott at Input on 01753 530444 ► Fax 01753 577311



OLEEnterprise presages Network OLE

Open Environment has released **OLEEnterprise**, a distributed object environment based on COM. OLEEnterprise makes use of Microsoft's RPC to deliver a distributed object model similar to Network OLE, the 'official' but as-yet unavailable network object model.

Under OLEEnterprise, developers can build OLE clients and OLE remote automation servers (using RPC) with their usual tools. The OLE objects are then automatically distributed through the OLEEnterprise client agent and remote automation class factory. At the client end, any OLE-compliant application can then access these distributed objects. Although at present OLE servers will be only Windows machines, clients do not have to be, as OLEEnterprise objects are accessible on a wide variety of Unix platforms through DCE as well as from Windows platforms. This non-proprietary approach makes for easier multi-platform access to three-tiered applications.

► Open Environment are on 01895 273671

The Net according to Krol

Internet guru and luminary, Ed Krol, author of the *Whole Internet Guide*, explained his vision of the future for the Net in a recent interview. According to Krol, there is a general misconception that the Net is a single entity, and has a central authority. Many people wrongly believe that the Internet and the World Wide Web are one and the same thing. Krol doesn't think that we are on the verge of a new information revolution just yet, and is sceptical about the future of Java: 'There is a future for small, distributed applications,' says Krol, 'but Java might not be the tool.' Java, he says, 'is the front runner in the race, but it hasn't got the race won and it could stumble before the finish line.' Although he admits, 'something will happen because of Java.'

Krol also spoke about IP/NG (IP Next Generation), the new Internet Protocol revision currently under discussion. Originally, IP/NG (or IP 6.0 as it was known then) was to be rushed in as an emergency measure to increase the available address space on the Internet. Once it was realised that the current range of addresses is not going to run out until perhaps the end of the century, the designers of IP/NG decided to add a few more features, such as bandwidth reservation - essential as the Net becomes used more and more for multimedia, bandwidth-intensive applications. An idea being mooted is the URN, or Universal Resource Name. Unlike today's URLs, a future Internet user making use of URNs will not need to know where a resource is located, but simply how to refer to it. The browser will then locate it for him.

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Letters

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Bug report – EXE Mug

Dear Sir,

I was fortunate enough to be given an *EXE* mug as a birthday present some years ago and I accepted then that the mug had a problem regarding which window was in focus. However, as the mug aged it was apparent that there were some memory leaks developing, and the background colour soon ceased to be as context sensitive as in the past. What was more disturbing was the moment when the mug actually crashed. In an uncanny resemblance to its original inspiration, the windows remained in place, and there was no evidence of anything having gone wrong. However, on trying to get a handle of any description, only nulls were returned. Fixes have only been temporary and I am now resigned to obtaining a completely new installation of the *EXE* mug.

However, times have moved on and the



old Windows 3.0 compatible mug does not quite meet the demanding standards of performance required in today's modern IT environment, so I have examined the best platform on which to place the new mug in order to avoid further crashes. Being fashion conscious, I first considered using Windows 95, but the thought of a mug implemented in 32 bits seemed rather inappropriate, and I did not want the prospect of having to upgrade mug 96 to mug 97 next year. I also considered Windows for Workgroups, but the virus problems likely to be caused by indiscriminate sharing of the mug would outweigh the advantages of it running 10% faster. I finally hit on the solution, and I would be grateful if you could advise me regarding the availability of such an option. I would like an X-Windows mug. It would run on any platform with little chance of crashing, it would not have to be in 32

bits, and it would be portable enough to be moved anywhere within reason.

John Martin

Email address supplied

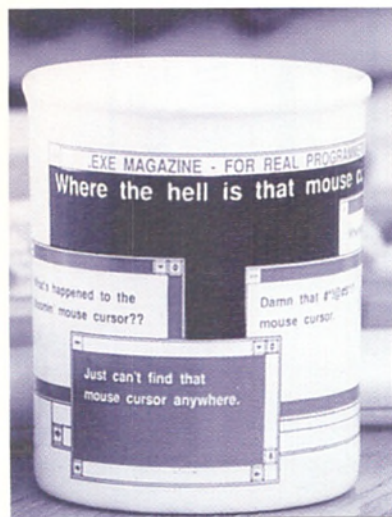
We are often looking for new incentives to offer for new subscriptions and renewals. Tell us what you would like (and send any ideas for a new *EXE* mug). – Ed

Paradoxical

Dear Sir,

Thank you for publishing my letter on the subject of Professor Penrose's ideas on the nature of consciousness. I was rather surprised at the tone of the response from Jules. Let me point out that:

- 1) Contrary to what Jules suggests, I do not have a 'religious persuasion' of any sort!
- 2) Jules more than once refers sarcastically to the term 'quantum amplifier' as if I had used this phrase. Since I did not (nor would I, since I am not sure what it means), this does seem rather odd!
- 3) I specifically did not reject the idea that machines may one day become conscious. Neither, I think, does Roger Penrose. The point here is that if Professor Penrose is right, any such machine would be performing processes which would not be equivalent to a computation, and could not even be simulated on a computer (regardless of speed or memory capacity).
- 4) If Jules feels that my letter 'poured scorn' on his ideas, I can assure him that this



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Fast learning curve for increased productivity	✓	—	✓
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Windows Tech Journal
December 1, 1995

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was not intended. I simply wished to point out that certain ideas which are commonly taken for granted may in fact be wrong.

The paradoxes to which I referred are not as easily dismissed as Jules suggests. The essential point here is that a conscious computer must not only process data and produce output responses, it must actually feel sensations in the same way as Jules would if he accidentally spilled a hot drink in his lap. The puzzle as to how the execution of a large number of lines of computer code can actually produce such a feeling is I think a real paradox. The same paradoxes do not apply to a rule based system or to neural nets unless you believe such programs are actually conscious.

These paradoxes do not disappear if you use parallel hardware. As I pointed out in my previous letter, we are concerned here with experiments in principle. Any parallel program could be simulated on a sufficiently powerful serial machine and the same paradoxes would apply. Neural nets can be (and often are) simulated on serial machines, so the same argument applies here also.

If a program could really feel pain as it executed (in the same way as Jules would if he tried the experiment suggested above) it would be interesting to consider what constitutes an 'execution'. Would reading such a program and 'executing' it mentally be sufficient? Would a non-electronic computer, such as a super Babbage engine be able to feel pain?

If Jules is right and a sufficiently powerful program can become conscious, we must start to think seriously about the consequences. Almost everyone accepts that animals should be rendered unconscious before being subjected to painful experiments. Presumably if Jules is right this will apply to computers at

some point, indeed how do we know whether it applies to our existing computers and software programs?

Although these arguments seem at their clearest when discussing pain, they obviously carry over to all other emotions. Indeed, I cannot see how a computer can be made to feel anything – nor can I see how we could tell if it had done.

I know that Roger Penrose has received some verbal flak in response to his ideas. I had not realised until I read Jules' reply to my letter that this would even extend to anyone who suggested that his ideas might be interesting!

Finally, I think that to discuss such a profound topic in terms of whether Penrose or Dennett is 'winning' or which of them is 'smarter' is really rather absurd.

David Bailey
Salford Software
Email address supplied

You have no evidence whatever that a machine must experience the sensation of hot coffee in the crotch the same way that I do. What if the machine has no crotch? Does that mean it is forbidden from becoming conscious? What if it is challenged less by heat than by high levels of UV, exactly unlike people? In fact, the issue of unlikeness is an important one when discussing consciousness; people who are transported to heights of ecstasy by Wagner get offended when I run screaming from the room to escape the cacophony. Do we experience the music in the same way? Clearly not.

Your 'paradoxes' are nothing of the sort. They are little more than semantic tricks. To explain; you take it as an item of faith that consciousness is not computable. There is not one shred of evidence either way, only opinion and belief. But even if we accept that, we know every example of consciousness which we've ever looked at requires a brain to host it. Brains are made of individual neurons; is it a paradox to ask which specific neuron causes the sensation of pain? If it is, we're thinking about the problem wrongly.

Whatever you say about lines of code, I can say about neurons, and somehow, neurons do manage to feel. Except, of course, brain surgery is performed with the patient awake, and the patient feels no pain. It's not the neurons that do the hurting, any more than it is the lines of code. It's *something else*.

I still think it's silly to the point of irresponsibility for anyone to assert that the completion of a modern, poorly-understood idea will give us an answer

we've all been searching for. There are two kinds of reactions in the universe; deterministic, and random. Most large-scale reactions are deterministic, and they are computable. Some reactions are not, and they can be either simulated or created. A normal computer connected to a Geiger counter can simulate anything that any mix of deterministic and random reactions can do. Nothing in quantum theory (or any conceivable extensions of it) can change that. But, appealing to some hypothetical extension of knowledge to answer a basic question about our most strongly perceived phenomenon is begging a pretty big question, it's untestable, and it is a statement about faith. It is, in fact, not science at all.

I agree with you, I cannot see how to make a computer feel anything at all. On the other hand, I can't see how a human feels anything at all, and yet clearly, they do. Ultimately, that's the question we need to answer in some form before we can ask about machines. It's not the idea that Penrose might have something interesting to say which I attacked; he does say a lot of interesting things. He also talks a lot of rubbish at times, and I'll even defend him when he does that. But, when someone says (as you did) that Penrose says this, therefore it is true, that I will attack. When, in saying that, you dismiss thousands of years of thought on the subject, including a lot of intense activity today, I will attack that. That's why I talk about religious persuasion; because, without evidence, any position about the origin of consciousness, any position at all, can be accepted today only by an act of faith. Faith isn't truth, but faith masquerading as truth is extraordinarily dangerous.

The debate continues furiously. Personally, I find it unsettling and highly implausible that computers will ever feel, because I am aware of all the logical problems that throws up. On the other hand, it is even more unsettling, and even less plausible, that they won't, not least because the logical problems created by that position are of a much more simple and direct nature. The most logically consistent position to take is that nothing feels anything, some things only think they do, and yet that view doesn't stand up to even cursory examination.

Your first letter started with your amazement that I accept so readily the idea that computers can become conscious. This is simple; either they can or they can't. We have the musings of Penrose, and the rantings of Searle (who

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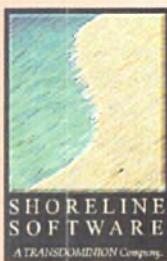
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should know better) to suggest they can't, but we have no experimental or theoretical reason whatsoever. In the absence of such reason, I accept they can (which, incidentally, is a far cry from taking it for granted). What is so amazing? – Jules May

More on Mayhem

Dear Sir,

I was very alarmed to read Jules May's reply to a letter from David Bailey in the March issue of *EXE* regarding the possibility of conscious machines. Jules is entitled to his opinion, or course, as is Mr Bailey. The difference between the two points of view, as expressed, seems to be that while Mr Bailey based his supposition on valid mathematical theory (and quoted the source), Jules based his on hearsay and vitriol.

I was reminded of something I read in a book written by Richard Feynman (I think) about scientists who, faced with a lack of experimental evidence or logical argument, attack an opposing theory using 'refutation by denigration'. Making snide comments about a correspondent's religious persuasion does nothing to instil confidence that Jules has a compelling and logical argument for his counter-claims. I thought it was ironic for Jules to close his reply with an admonishment to Mr Bailey for pouring scorn on his beliefs, when his entire reply came across as indignant and self-righteous rage.

I am a software developer and, like many of my colleagues, have a fascination with Quantum Mechanics, Cosmology and other related subjects. I have read Penrose's book 'The Emperor's New mind' and remain undecided on the subject. However, Penrose makes the very clear point (re-iterated by Mr Bailey) that there are processes that are

inherently non-computable. This viewpoint is backed up with solid mathematical argument based upon Gödel's incompleteness theorem and illustrated using a Turing universal computing engine.

I believe that for Jules to justify his position he must show that a) Penrose is wrong or b) such processes do not play a part of consciousness. For if the processes *do* play a part in consciousness, surely it must be wholly or partly non-deterministic and therefore not susceptible to mathematical or mechanical modelling.

I cannot lay claim to understanding, or even knowing, all of the issues this point raises. To be honest, a lot of the finer points of Penrose's (and others) mathematical reasoning is difficult to understand by the lay-person and goes way beyond my maths education. However, I believe that I can follow a logical and well-reasoned argument as well as the next man and I had trouble following Jules'. I won't let you know what my religious persuasion is – just in case.

PS The magazine is excellent – keep up the good work.

Marvey Mills

Sevron Software Development

Email address supplied

Mr Bailey's ideas, and those of Penrose which he used, are not by any stretch of the imagination based on valid mathematical theory. There's a whole lot of maths you can weave around non-computability, but that's not what's going on here. I have no problem with the notion that somewhere at the heart of consciousness there is some random event going on. It could be quantum theory, it could be no more than thermal noise. Has anybody bothered to measure the signal to noise ratio of a neuron?

No, that's not what offends me. What offends me is the application of psychobabble and pseudo-science to something we know practically nothing about (certainly not enough to constrain into mathematical formalisms), and then to claim that the secret to this mysterious phenomenon lies just beyond the grasp of our most opaque theory. It's not science; it's not mathematical, it's not provable or testable. It's musing.

Musing on it's own isn't so bad, of course, and I'll deny nobody their inspiration. But when this idle musing is dressed in the trappings of fashionable theory, and persuades the ignorant that it's fact – true in the way that all other musings and speculation and even experiment-driven hypothesis are not – that is beyond musing, it's pernicious nonsense.

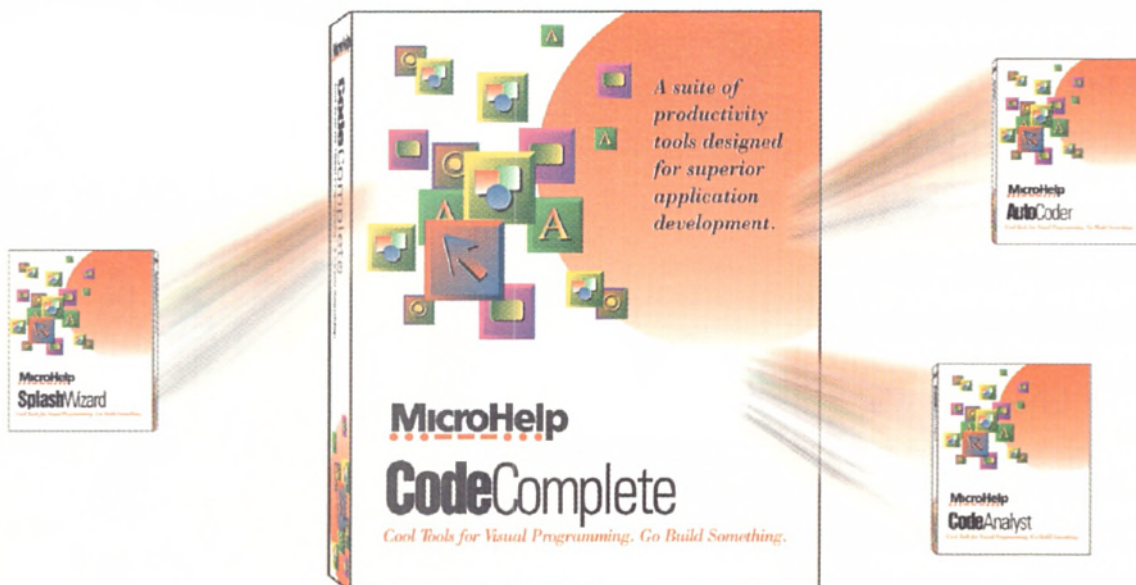
Since Penrose claims that quantum processes play a pivotal part in consciousness, showing that they do not, and showing that Penrose is wrong is the same thing. In fact, I do not have to show any such thing. I have to show that the processes going on can be mechanised in some way – whether real brains use quantum processes is quite beside the point. (For the record, I can't do that, and neither can anybody else.) Furthermore, a process with a random component can be simulated accurately on a purely deterministic machine provided that the machine has access to at least one truly random source. Penrose knows this perfectly well – by appealing to an extension of quantum theory he's asking for a process which is neither random nor deterministic, but somewhere in between. Presumably he means a process which is constrained in some, unspecified manner.

I have extreme difficulty showing that Penrose is wrong. I can think of no experiment, theory, or simulation which would make the slightest dent in Penrose's ideas. Not even the synthesis of a truly conscious machine would do it! And that, ultimately, is what is wrong with the ideas – they are not falsifiable at all (falsifiability is the single measure of validity of a theory). If one were to take Penrose at his word, one would suppress all research and thought on consciousness on the grounds of its futility for the foreseeable future, until such time as quantum theory catches up with the demands placed upon it. That would be ridiculous even without the research which is showing the way towards a mechanistic, computable basis for consciousness.

Penrose has made a number of valuable contributions to the debate. But to regard his ideas as the obvious last word (which Mr Bailey appeared to do in his very first sentence), without one shred of experimental or theoretical evidence either before or after the fact, nor even any possibility of any, is, precisely, an act of faith. And, to use that faith to tell me I'm wrong (when I don't even have a belief) is an act of dogmatism which I won't tolerate. 'Religious persuasion' was not a snide comment; I meant it quite literally.

Oh, and if you thought that my reply was vitriolic and raging, perhaps you should read it more slowly. The argument, though briefer and more superficial than Penrose's two volumes, does have some flow to it. – Jules May

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A lesson in

For most developers, golf is not the first thing which springs to mind when they consider application partitioning.

Christine Comaford, however, sees a distinct analogy. She asks: will partitioning be 'a hole in one, or just another client/server application development bunker?'



First there was easy GUI painting, then there was RAD, and now the hot marketing ploy is application partitioning... I mean, what is it with these tools vendors? Do they think we'll check off partitioning as one more exciting feature in the list? Well, it's not. Partitioning is a design issue. It's not something that magically happens by pushing a button, or dragging and dropping from a list.

The only reason you care about application partitioning is that you expect to do distributed computing. This implies you expect to build applications that will have to scale over time to more users at more sites with more needs than you originally planned. You also want to make distributed computing resources available to more applications. So, be paranoid. Plan for the worst case. Scalability issues most often occur after a successful deployment, when

more users than we expected want our application.

I recommend the following techniques to ensure successful partitioning. First, create a standard questionnaire that you can fill out with the end-users. This way you'll understand from the start if you really need to do partitioning, and the need will be driven by the business, as opposed to by developers wanting to try the newest techniques! Next, you need to understand the keys to

partitioning

reliable partitioning, as well as the types. Finally, you need to understand the future of partitioning to guarantee that you design for tomorrow.

A partitioning requirements form

Design your application in a modular way so you can choose over time to partition, or distribute, data or processing. Create a form to ensure everyone in your company follows a common line of questioning to gather information on how to partition. The following questions will get you started. Add your own as well!

Location.

Where will the users of the system be located? What is the location of the servers? How much information and what type of information is needed by users in different locations? Does system functionality vary from one location to another? Does the type of data accessed vary depending on the location?

Usage.

How many users are there today? In the future? How often will users be using the system? When is the transaction load of least, average, or greatest intensity? Which transactions are executed most often? What is the volume of data?

Performance requirements.

Is there extensive database access? What percentage of the data is read only? Is there extensive updating? Are queries ad hoc or canned? How important is speed of the application to the user's work? How much traffic will there be between applications? Between locations? What applications are unique to clients? Unique to locations?

Data refresh.

Is the data access real time or historical? How often must users' data be refreshed? How often should uploads to the database server occur? What are the segments of data needed by client? By location? Do schedules for uploads and downloads vary for clients at the same location? What data can reside on client machines?

This is a high level start. Together, the database analyst, transaction architect,

system architect, user liaison and business analyst need to work out the details.

Assess the need for transaction processing monitors or object request brokers. Also consider parallel compilation and remote compiling and debugging. Linking an SQL-Windows Quick Object or Powersoft DataWindow to a remote procedure is trivial compared to the power of working in a single language to create all partitions, both local and remote. Ask your vendor how he'll provide this to you.

Tips for success

Seventy percent of the client/server applications you are building today will be obsolete within two years. That bothers you, doesn't it? Good. Gartner Group further states that this statistic has a 70% probability. Why this gloomy prediction? Because we are building systems tactically, not strategically. We are building for today, not considering the future. We are pressured by management to meet our deadline, without support for taking the time to learn proper design skills. We are doing *rabid*, not rapid, application development.

We tried fat client architecture. It was easy to administer, tune, operate, and implement. But hard to maintain, didn't leverage the power of the server, didn't promote code reuse, resulted in poor server response time, had a single point of failure, and scaled only through upgrading the client or installing a faster network.

We tried fat server architecture. It was easy to administer, tune, operate, implement, and maintain. But hard to leverage the power of the client, integrate applications well with other desktop applications (through technologies like OLE), resulted in poor response time on constraint violations, had a single point of failure, and scaled only through a server upgrade.

This is why we need to partition our applications. But I don't think three tier is a good idea – it locks you into a mental model. Think multi-tier instead. Here are seven 'commandments' for partitioning success.



Don't fall for the allure of first generation client/server tools. While these tools are attractive in the workgroup and



department, they do not have the power of enterprise scalability.

Know your transaction rates. Not the rate of database COMMIT statements, but the rates of actual business transactions.



Don't follow the road of expedient hacking. Quick hacks are easy at first, but ultimately yield rocky and unmaintainable applications. Document decisions made. Implement partitioned code wherever possible. The road of the sound architectures will pay off with ease of maintenance, reuse, and scalability.



Moderation in all things is good. Following any approach blindly will lead to the rise of fanatics who preach orthodoxy, following the letter of the law but not its spirit. Some logic, when partitioned, will not execute efficiently. Follow the spirit of scalability, not the orthodoxy of partitioning.



Pay your dues. When everything is going well, it is hard to see the need to buy modeling, system management and process management tools, but when trouble rears its ugly head, such sacrifices will seem very wise.



Don't introduce chaos into the system. Too many components or too many tools will not make matters improve – successful technique and architectures are always elegant and simple.



Distributed systems work in mysterious ways. Take care to make sure your system is as predictable, documented, and maintainable as possible. Plan for disasters – with par-

tioned systems, problem diagnosis is complicated by the immaturity of distributed system monitoring tools.

What are the partitioning types?

Client/server development is like golf. You can play mini golf where the goal is just to get the ball in hole, you can go to the driving range, where you'll hit the ball far, but without aiming much. Then there's 'real' golf, where you have other golfers to interact with, bunkers, water traps, trees, and long distances to walk. What we need in our client/server tools is the ease of mini golf, with the power of real golf.

Hitting a 400 yard hole in one is hard, but it's trivial compared to building a distributed application. Coding a distributed application is hard (different programming languages on client, middleware, database server), updating distributed software components is hard (getting new pieces to new or old places), and on top of all this, debugging distributed applications is near impossible (no client/server debugging tools).

In real golf you wouldn't use the same club for all shots. If you are building serious client/server applications, don't put all your code in the same tier. You need to partition. There are four types of partitioning: basic client/server, data, logic, and object. Partitioning success requires three things: the right architecture, the right tools, and the right skills. I expect you to apply standard staff roles in client/server.

Client/server: Mini golf.

User interface, field and cross-field integrity logic, business logic, desktop and shareable component services execute on the client. Transactional integrity logic and data management are implemented to execute on a single server. Normal skills and roles apply.

Data partitioning: Real golf.

The client tier is the same as in client/server above, but transactional integrity logic and data management execute on multiple servers, local data is kept on LAN servers, corporate data is kept on a central server. Skill exceptions: the database analyst requires training on distributed issues including backup, restore, two-phase commit, replication, and distributed recovery; the infrastructure coordinator must produce plans for network downtime.

Logic partitioning: Shooting at par.

This includes three-tier, *n*-tier, and peer-to-peer architectures. User interface, field and cross-field integrity logic execute on

the client. Business logic, desktop and shareable component services execute on the client or on an application server. Transactional integrity logic executes on an application server. Data management is on a large central data server. Skill exceptions: the systems integrator must develop skills for distributed load testing, distributed debugging, and disaster planning. The back-end programmer may need new skills in transaction processing (TP) monitor tools, DBMS stored procedures, and remote procedure call (RPC) or messaging tools.

The future of partitioning

To recap, distributed application components include the user interface, business logic, and transactional integrity logic. We place these components in different tiers for many reasons, most often to improve performance and simplify maintenance. It's easy to throw stuff around. But to succeed

What we need in our client/server tools is the ease of mini golf, with the power of real golf.

in distributed computing you need the right tools, architecture, and staff roles. Skip one and you are deep in a bunker! Now let's consider a future partitioning architecture: object partitioning.

Object partitioning is the most sophisticated distributed environment. Today's distributed environments assume that an object and all of its methods are co-located on a single machine. But it would be far more interesting if an object's methods could be located on different machines. For example, the user interface of an object would be on the client, its business logic methods would be on an application server or in a database, and its transactional integrity logic would be in the database. Staff skill exceptions would be: the busi-

A partitioning starter kit

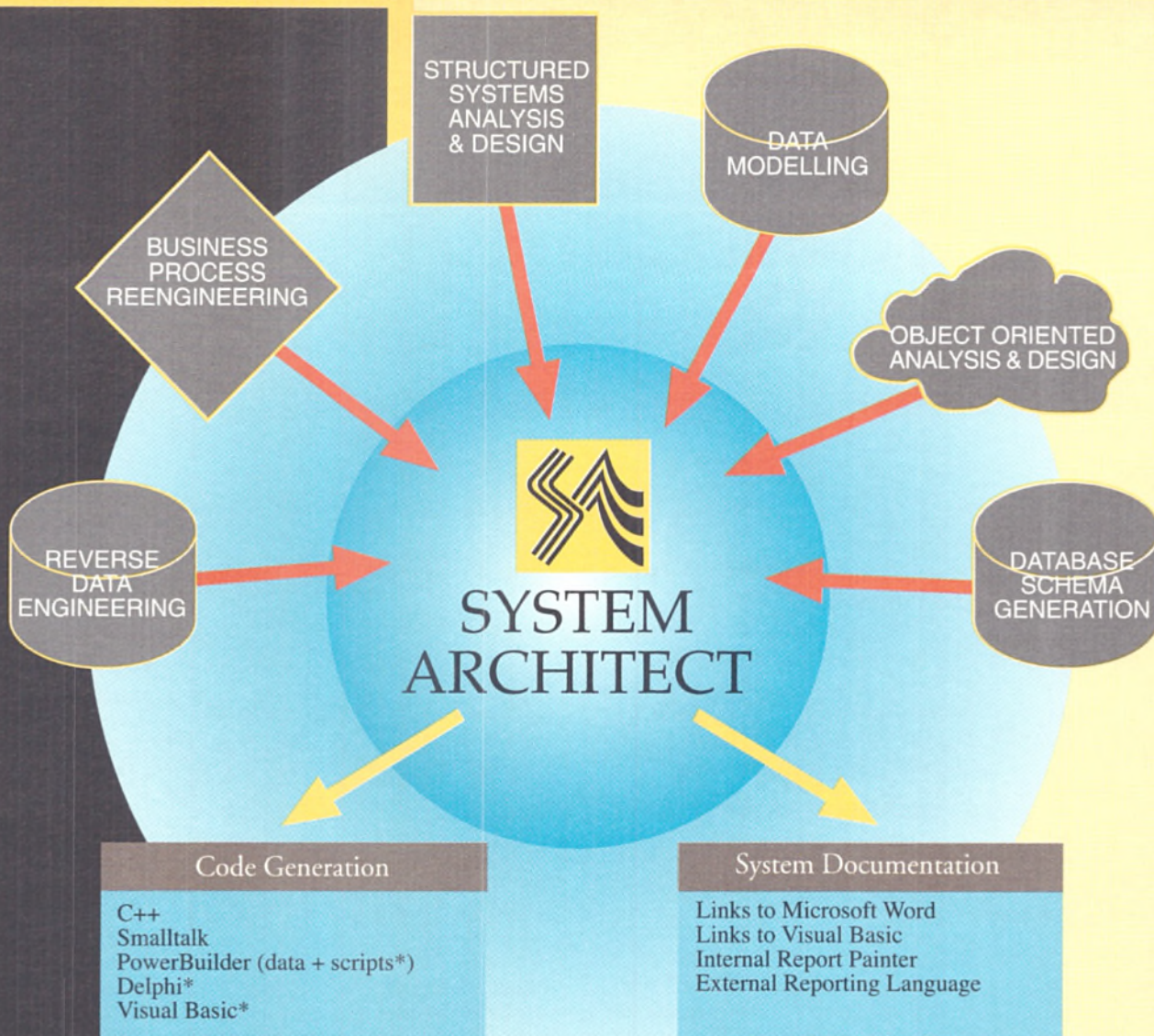
Meet Christine in the clubhouse! Send her your physical mailing address and phone (not just email address, please!) and she'll send you a 'partitioning starter kit', with a test and answers to determine the right distributed computing architecture per your user's and business needs, as well as the roles in client/server projects and how they change when partitioning is used. Let's make sure you have the right skill sets on your projects.

ness analyst will learn object-oriented analysis and design (OOAD) methods and tools. The features programmer will become an assembler of components either purchased or written by the back-end programmer. The back-end programmer will be writing the business-level objects which will encapsulate the business in object methods, structures, and relationships, and will learn object-oriented design and programming (OOD and OOP) tools and techniques. As databases evolve to become object-relational and based on object request brokers (ORBs), the database analyst will need to evolve her skillset.

Object partitioning is how we are going to do component-based development. But we need to master data and logic partitioning in the meantime. Some vendors are addressing this. For example, Oracle's high-end development tool, Developer/2000 has a 4GL (yes, good old PL/SQL) that supports Entera, Tuxedo and Encina APIs for TP monitors. PL/SQL is extensible, so you can add your own functions. You also have the same language and editor on client and server. And they'll have distributed debugging next summer. I bet they'll also be among the first with object partitioning. ■

Christine Comaford is president of Corporate Computing, an LBMS subsidiary. LBMS provides application development management products. She can be reached via email at 74603.3664@compuserve.com or by fax (0171 878 8709).

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32-bit spelunking with Delphi 2.0

Anyone who has read the foreword to Matt Pietrek's excellent new book *Windows 95 System Programming Secrets* (IDG, 1995) won't need any further explanation of what is meant by 'spelunking'. For those who haven't read it, spelunking appears to be American terminology for what we would call pot-holing; crawling along through dozens of twisting, turning little passages, often in total darkness, knee deep in water and sometimes even having to swim along underwater to get from one cavern to another. By virtue of the present writer's not inconsiderable bulk, this is a dubious pleasure which I'm happy to say I've never sampled, but both Pietrek and myself have spent many happy hours 'spelunking' the inside of Windows 3.1 and Windows 95, a far less dangerous pursuit.

Although most of my pot-holing has – up until now – been confined to the 16-bit code inside Windows, Delphi 2.0 represents a superb tool for extending that exploration into hitherto unplumbed 32-bit regions.

Linking by name or by ordinal

When 16-bit Windows was originally developed, Microsoft implemented two different techniques for importing routines from DLLs. You could either import by name or import by ordinal number. Whether we're talking about load-time linking (ie you link with an import library and the linker builds import references into the .EXE file) or whether we're talking about run-time linking (you use `LoadLibrary` followed by `GetProcAddress`), the same thing still applies – you can link either by name or by ordinal.

Linking by name is less efficient because the EXE loader (part of the KERNEL library) has to perform string comparisons on function names. Linking by ordinal is more efficient but is vulnerable to Microsoft changing the ordinal numbers of exported functions from one release of Windows to the next. This never happened (well, not with the

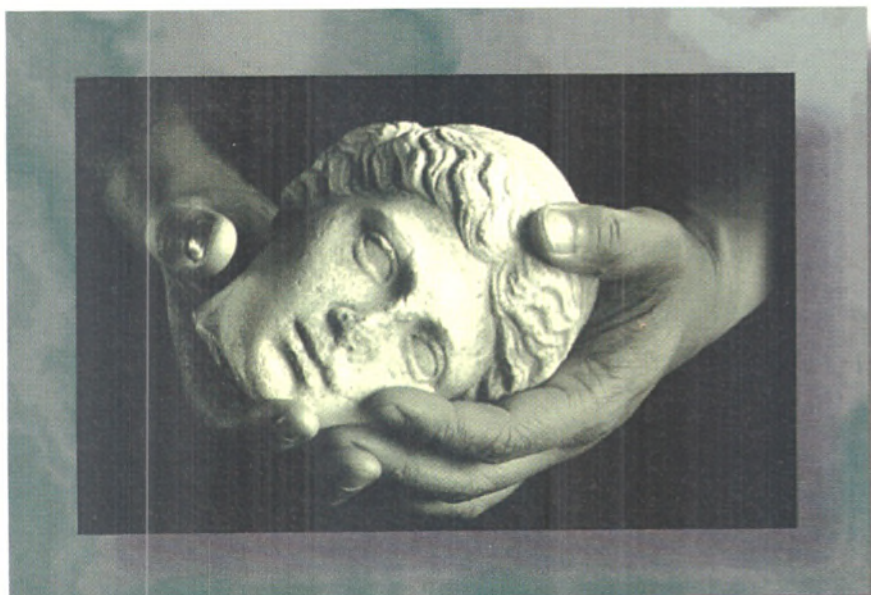
documented routines anyway!) under 16-bit Windows but Microsoft have warned that 32-bit applications should move over to importing by name as the standard technique under all Win32 platforms.

In order to improve the efficiency of linking by name, Microsoft added 'hint numbers' to the dynamic load mechanism. This means that even though a name is supplied, there's also a subsidiary ordinal 'hint' number which tells the EXE file loader approximately where to start looking for the function in the dynamic library's list of exported function calls. This enables dynamic linkage to be resolved much more quickly at run-time for improved system performance. Thus we have the best of both worlds – a fast, efficient system which does not cast ordinal numbers in concrete.

The GetProcAddress hack

Microsoft has long been famous for using all manner of undocumented routines in its own code. Unfortunately, when you export a rou-

'Pot-holing' can be easier with Delphi than it is with C++ or C: **Dave Jewell** demonstrates one or two undocumented aspects of the Delphi compiler itself and uncovers some of Windows 95's innermost secrets...



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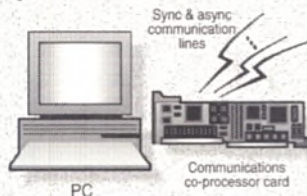
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tine, the name becomes very visible to 'file sniffing' utilities. In order to get around this, and to deter the likes of people such as Pietrek and Schulman, Microsoft implemented a number of new, undocumented routines in the 32-bit Windows 95 kernel which have no associated name. They are exported by ordinal number only thus preventing them from showing up in file dumps and (just as importantly) giving no clue to their intended function.

The simplest way of calling such a routine, of course, is to use a combination of `GetProcAddress` and `LoadLibrary` to retrieve the function name. This is standard practice – provided that you know the name of the dynamic link library where a routine is located and the ordinal number of that function, you can always get a callable address for the code.

Well...not quite always. In order to prevent such skulduggery, Microsoft added a special hack to the `GetProcAddress` routine. Put simply, if it detects that a routine's address is being requested by ordinal number and if that routine resides in the `KERNEL32` library, then `GetProcAddress` fails the request. This prevents any interested party from establishing a run-time link to the wanted code.

But there's more than one way to skin a cat – or so I'm told, never having tried it myself. From a C/C++ perspective, the standard approach is to use an import library which references the needed routines. It goes without saying that the functions we're talking about are absent from Microsoft's import libraries. In his book, Pietrek describes how to create your own import library which enables easy linking to the undocumented `KERNEL32` functions. But from a Delphi perspective, things are even easier.

No name-references in Delphi

Delphi does not use import libraries. Rather, it uses import units which reference needed routines by specifying the DLL name and ordinal number directly in the source code. An example of this is given below for the `InvalidRect` API call:

```
function InvalidateRect; external user32
    name 'InvalidateRect';
```

This just tells the compiler that the wanted function is located in the `USER32` library. In this particular case, no ordinal number is specified. As far as the 16-bit compiler is concerned, specifying an ordinal number effectively *overrides* the routine name – the routine is linked only by ordinal. Under the 32-bit compiler, things are slightly different. When an ordinal number is given it acts as a 'hint number' as described above. It's used as a starting point for finding the matching routine by name.

One of the interesting undocumented routines in `KERNEL32` is called `LoadLibrary16` – it has an ordinal number of 35. Using this call, a 32-bit Windows application can load a 16-bit DLL. When I first tried to code up this routine, my function declaration looked like this:

```
function LoadLibrary16 (
    lpLibFileName:
    PAnsiChar): HMODULE; stdcall;
external kernel32 index 35;
```

At the time, I didn't realise that specifying an index number did not alter the fact that the routine was linked by name using the ordinal as a starting point. As soon as I tried to run the program, the EXE loader code generated an error and aborted the program execution. The reason, naturally, is that the loader was trying – and failing – to find a `KERNEL32` export called `LoadLibrary16`. After looking at the output from Borland's excellent TDUMP program (also written by Pietrek, so I'm told), this is what I saw:

```
Imports from kernel32.dll
QT_Thunk          import by name only,
                  no hint
LoadLibrary16 (hint=35) import by name with
                  hint number
```

The first routine, `QT_Thunk` is being referenced by name only – there's no associated hint number. The second routine – `LoadLibrary16` – is *also* being referenced by name. All the ordinal number does is supply the hint number.

Once I realised what was happening, I was somewhat dismayed. It seemed that there was no way to set up a 'pure' ordinal-only import using Delphi 2.0. Horrors! Then I remembered that the 16-bit compiler provides a mechanism to import a function

which can be named differently in the actual DLL. This is done by adding a 'name' clause to the function declaration. On a hunch, I tried modifying the above function declaration like this:

```
function LoadLibrary16 (
    lpLibFileName:
    PAnsiChar): HMODULE; stdcall;
external kernel32 name '' index 35;
```

Sure enough, it worked! By specifying a name clause with an empty string, the compiler generated a pure ordinal-only reference and the program executed with no problems. This is reflected in the corresponding TDUMP listing:

```
Imports from kernel32.dll
QT_Thunk          import by name only, no hint
35                import by ordinal only, no name
```

The wonderful QT_Thunk

Now that you know how to call the `LoadLibrary16` routine, take a look at Listing 1. This introduces a couple more routines, `FreeLibrary16` and `GetProcAddress16`. All three routines operate on 16-bit DLLs, allowing us to load them and retrieve the address of 16-bit code from within a 32-bit application. Unfortunately, we can't just call into a 16-bit DLL from a 32-bit process. For a start, the procedure address returned from `GetProcAddress16` is in `seg:offset` format – it's not a callable 32-bit linear address from our perspective. We need to thunk down to the 16-bit code.

Thunking down to 16-bit code is easily accomplished through another routine called `QT_Thunk`. Armed with a `seg:offset` pointer to the wanted code, you simply push the various parameters of the target routine onto the stack, load the `EDX` register with the

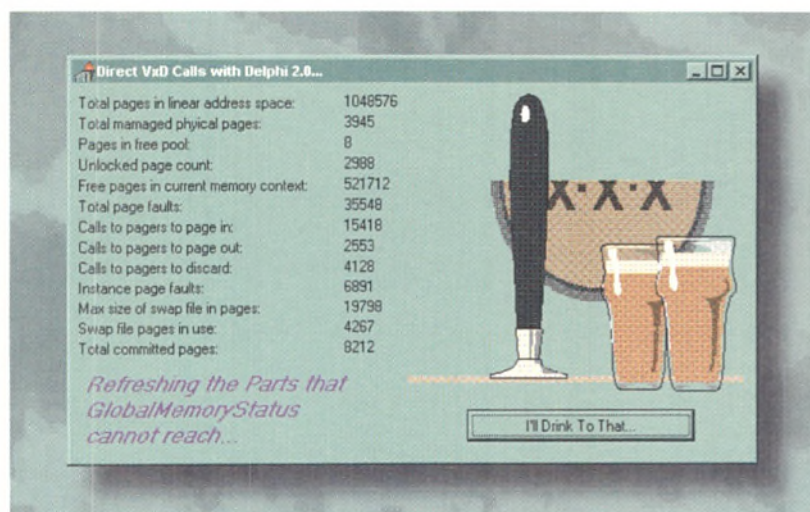


Figure 1 – Do you thirst for new programming opportunities? Check out Delphi's ability to spelunk the undocumented Windows routines that Microsoft would rather you didn't reach...

procedure pointer and then call `QT_Thunk`. This takes the processor through another series of twisting, turning little passages which end up in the wanted 16-bit code.

Listing 1 is a complete example program which brings together the various concepts that I've discussed so far. It merely makes a couple of calls to the 16-bit `GetFreeSystemResources` API routine and then displays the results of these calls in a message box. Normally, 32-bit applications can't access `GetFreeSystemResources` – there is no equivalent call in the 32-bit API. Presumably Microsoft believe that this sort of information is an architectural hang-over from the bad old days of 16-bit code and should be allowed to fade away and die. Despite this, they took care to 'fudge' the `GetFreeSystemResources` return values so as to present a far rosier picture than was the case with Win-

dows 3.1. For those that are interested, this fudging process is well documented in Pietrek's book.

As you can see, `QT_Thunk` is a useful technique. It allows an application to call down to 16-bit code in a relatively straightforward manner. You don't have to start fooling around with the thunk compiler or any of that nonsense. It's therefore ideal for those situations where you've ported your main application to 32-bit but are unable to port subsidiary DLLs for reasons of time, or because you don't have access to source code. The above notwithstanding, the usual caveats about undocumented routines apply. As ever, you should only resort to such techniques where no other practical solution is available. This technique will not, unsurprisingly, work under NT. Not only is there no `QT_Thunk` routine exported from NT's KER-

NEL 32 library, but the architecture of NT's 16-bit WOW sub-system is so radically different as to render these heap usage figures meaningless.

Before leaving the subject of `QT_Thunk`, look carefully at the assembler code in the accompanying listing. You'll see that the code first stores the current stack pointer into the ESI register and then subtracts 0x1000 from the current stack value. At the end of the assembler section, the stack pointer is restored to its original value. If you don't bracket one or more calls to `QT_Thunk` in this way, then your program will die a horrible death. This is because `QT_Thunk` uses the stack to build some internal information and it doesn't always care about treading on other people's toes! By tweaking the stack pointer in this way, I've left lots of room for manoeuvre.

Easy VxD calling

In addition to the routines we've looked at so far, `KERNEL32` also exports a set of callable routines which make it very easy to use VxD services directly from a 32-bit application. The function prototypes for these routines are given in Listing 2. The odd name of each routine relates to the number of bytes of parameters that are pushed onto the stack. For example, `VxDCall24` expects to find 24 bytes of parameter information made up of six 32-bit quantities. As with the other routines discussed above, all these `VxDCallxx` routines are pure ordinal-only imports.

Each routine takes a 32-bit service code, the high word of which indicates which VxD is being called. A value of 1 in the high word specifies that we're calling the Virtual Machine Manager (VMM), a value of 0x2B indicates that we're calling `VCOMM`, the virtual COMM device, and so on. The low order word of the service code indicates the routine that we're using in a particular VxD.

This new VxD interface is called the `WIN32 VxD` interface. Since it is stack-based, it's directly callable from both C and Pascal (and yes, even Visual Basic!) applications. In other words, we don't have to start mucking about with registers or writing reams of assembly code as we'd have to do when calling a VxD service in a more conventional way. The `WIN32 VxD` interface also has a very low run-time overhead. These facts alone make it very tempting to use these calls, even though they're undocumented!

Internally, a number of the `WIN32 API` calls are really just wrappers around VxDs. For example, all the Windows 95 Registry calls are implemented through the `ADVAPI32.DLL` library from where they map straight down onto VMM services. This library exports a large number of routines, the vast majority of which are simply direct

```
program thunk;

uses
  Windows, SysUtils;

function LoadLibrary16 (lpLibFileName: PAnsiChar): HMODULE; stdcall;
external kernel32 name '' index 35;

function FreeLibrary16 (hLibModule: HMODULE): Bool; stdcall; stdcall;
external kernel32 name '' index 36;

function GetProcAddress16 (hModule: HMODULE; lpProcName: LPCSTR): FARPROC; stdcall;
external kernel32 name '' index 37;

procedure QT_Thunk; external kernel32;

var
  hUser16: HModule;
  FSRProc: Pointer;
  UResult, GResult: Word;
  szBuff: array [0..255] of Char;

procedure GetFSR;
begin
  hUser16 := LoadLibrary16 ('USER.EXE');
  FreeLibrary16 (hUser16);
  FSRProc := GetProcAddress16 (hUser16, 'GetFreeSystemResources');

  // Call GetFreeSystemResources twice for USER & GDI info

asm
  mov  esi,esp
  sub  esp,1000h

  push 1           // GDI
  mov  edx,FSRProc
  call QT_Thunk
  mov  GResult,ax

  push 2           // USER
  mov  edx,FSRProc
  call QT_Thunk
  mov  UResult,ax
  mov  esp,esi
end;
end;

begin
  GetFSR;
  StrPCopy (szBuff, Format ('USER Resources = %d%%, GDI Resources = %d%%',
    [UResult, GResult]));
  MessageBox (0, szBuff, 'Thunk', mb_ok);
end.
```

Listing 1 – Example program which merely makes a couple of calls to the 16-bit `GetFreeSystemResources` API routine and then displays the results of these calls in a message box.

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```
function VxDCall8 (Service, p1: LongInt): HMODULE; stdcall;
external kernel32 name '' index 2;

function VxDCall12 (Service, p1, p2: LongInt): HMODULE; stdcall;
external kernel32 name '' index 3;

function VxDCall16 (Service, p1, p2, p3: LongInt): HMODULE; stdcall;
external kernel32 name '' index 4;

function VxDCall20 (Service, p1, p2, p3, p4: LongInt): HMODULE; stdcall;
external kernel32 name '' index 5;

function VxDCall24 (Service, p1, p2, p3, p4, p5: LongInt): HMODULE; stdcall;
external kernel32 name '' index 6;

function VxDCall28 (Service, p1, p2, p3, p4, p5, p6: LongInt): HMODULE; stdcall;
external kernel32 name '' index 7;

function VxDCall32 (Service, p1, p2, p3, p4, p5, p6, p7: LongInt): HMODULE; stdcall;
external kernel32 name '' index 8;

function VxDCall36 (Service, p1, p2, p3, p4, p5, p6, p7, p8: LongInt): HMODULE; stdcall;
external kernel32 name '' index 9;
```

Listing 2 – Function prototypes for a set of exported KERNEL32 routines which make it very easy to use VxD services directly from a 32-bit application.

calls to another unimplemented KERNEL32 routine called `CommonUnimpStub`. I'm sure you can guess what that does! All the NT-only calls which might crop up in an executable are stubbed out through the `ADVAPI32` library so that the executable in question will at least load successfully, although it will fail as soon as an unimplemented routine calls `CommonUnimpStub`.

As an illustration of how the Registry routines map down onto the VMM, here's an example which shows what the `RegDeleteValue` routine does:

```
LONG APIENTRY RegDeleteValue (
    HKEY hKey,
    LPCSTR lpValueName)
{
    return VxDCall12 (0x10016, hKey, lpValueName);
}
```

A service code of 0x10016 specifies service number 0x16 in the VMM VxD. The `VxD-Call12` routine is used since this particular API needs to pass a total of 12 bytes of parameters to the Kernel, including the service code itself.

The above code won't actually compile cleanly – it's for illustrative purposes only.

This is because the function declarations for the `VxDCallxx` routines assume that all the parameters following the service code are long integers. You'd have to cast `hKey` and `lpValueName` to long integers in order to make the compiler happy. If you were doing it with Delphi Pascal, you could use the nifty **absolute** specifier like this:

```
function RegDeleteValue (
    hKey: HKEY;
    lpValueName: PAnsiChar): LongInt;
var
    p1: LongInt absolute hKey;
    p2: LongInt absolute lpValueName;
begin
    RegDeleteValue := VxDCall12 (0x10016, p1, p2);
end;
```

Of course, there would be no advantage to rolling your own registry calls in this way and I'm certainly not advocating that you should do so. I'm merely showing how the registry API calls straight down to the VMM VxD. If you were to use such techniques inside your own application, then you'd immediately lose source code compatibility with Windows NT where VxDs are a foreign concept. Besides, in reality, `RegDeleteValue` is a little bit more complex than I've indicated here. All the Windows 95 Registry routines have to determine whether or not the key they get given is local or remote. If the latter, then the API call doesn't go through the VMM at all.

These techniques are more useful when we want to do something which isn't supported by the API or where the VxD can provide us with more information than we'd get from making API calls alone. As an example of this, look at the code shown in Listing 3. This is a simple little Delphi routine which responds to a periodic timer 'tick' generated by a `TTimer` component. Each time that a tick takes place, the routine uses `VxD-Call12` to call the `_GetDemandPageInfo` service in the VMM VxD. This fills in a data structure whose layout you can establish by looking in the Windows 95 DDK (Device Driver Kit) documentation. It provides a lot more information that is available through the 'official' `GlobalMemoryStatus` routine as you can see from my somewhat whimsical demo program in the accompanying screenshot!

If you thrive for new programming challenges, check out Delphi's ability to spelunk the undocumented Windows routines that Microsoft would rather you didn't reach... ■

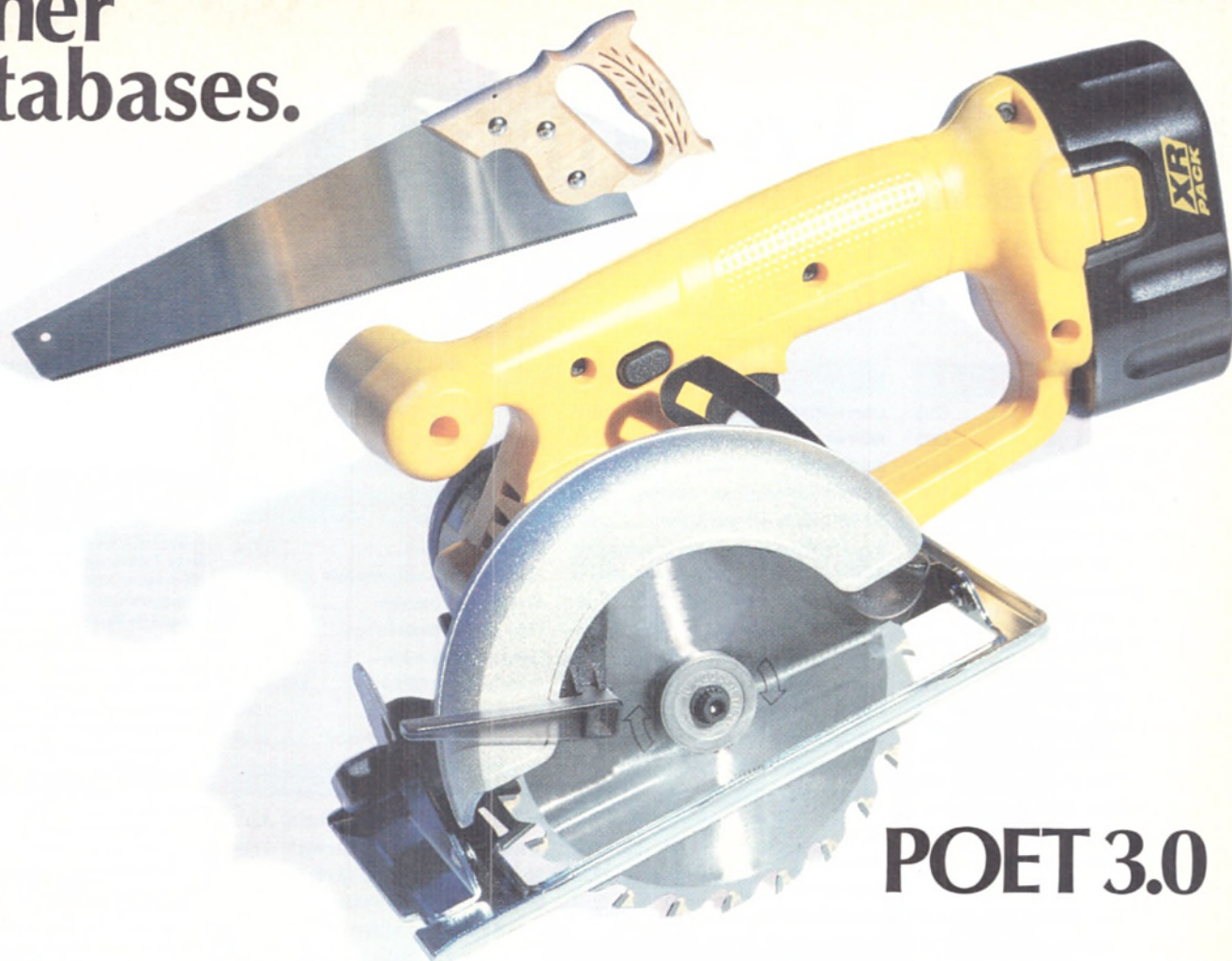
```
type
    DemandInfoStruct = record
        DILin_Total_Count: LongInt;
        DIPhys_Count: LongInt;
        DIFree_Count: LongInt;
        DIUnlock_Count: LongInt;
        DILinear_Base_Addr: LongInt;
        DILin_Total_Free: LongInt;
        DIPage_Faults: LongInt;
        DIPage_Ins: LongInt;
        DIPage_Outs: LongInt;
        DIPage_Discards: LongInt;
        DIInstance_Faults: LongInt;
        DIPagingFileMax: LongInt;
        DIPagingFileInUse: LongInt;
        DICommit_Count: LongInt;
        DIRes1, DIRes2: LongInt;
    end;

procedure TForm1.Timer1Timer(Sender: TObject);
var
    dis: DemandInfoStruct;
begin
    VxDCall12 ($1001E, LongInt (@dis), 0);
    with dis do
    begin
        F1.Caption := IntToStr (DILin_Total_Count);
        F2.Caption := IntToStr (DIPhys_Count);
        F3.Caption := IntToStr (DIFree_Count);
        F4.Caption := IntToStr (DIUnlock_Count);
        F5.Caption := IntToStr (DILin_Total_Free);
        F6.Caption := IntToStr (DIPage_Faults);
        F7.Caption := IntToStr (DIPage_Ins);
        F8.Caption := IntToStr (DIPage_Outs);
        F9.Caption := IntToStr (DIPage_Discards);
        F10.Caption := IntToStr (DIInstance_Faults);
        F11.Caption := IntToStr (DIPagingFileMax);
        F12.Caption := IntToStr (DIPagingFileInUse);
        F13.Caption := IntToStr (DICommit_Count);
    end;
end;
```

Listing 3 – Simple little Delphi routine which responds to a periodic timer 'tick' generated by a TTimer component.

Dave is a freelance journalist, author, computer consultant and unashamed Delphi enthusiast. Parts of this article are taken from his forthcoming book on 32-bit API programming with Delphi, to be published this summer. You can contact Dave as djewell@cix.compulink.co.uk.

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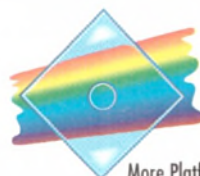
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Robust scripts

Many things can go wrong in a computer system. **Peter Collinson** shows that it often doesn't take a lot longer to create a robust script that will survive unexpected events.

In February, I was asked to do a simple job for a local company. They have several UNIX workstations that capture data and a central filestore backed up on optical media. They wanted to move the data from the workstations to the central filestore and free up space on the workstations by deleting the original files.

Since the central filestore and the workstations are connected using the Network File System (NFS), this should have been a simple task. Let's see, it should have just been a single command: `mv`. At worst, a pair of commands, `cp` and `rm`, are needed.

Many people would just go ahead and install a two or three line shell script to be called by the `cron` system. The script will wake up at night, do the copies and remove the files. It's a quick hack, taking at most three minutes to install. It would work brilliantly well until something went wrong. Without any doubt, some catastrophe would strike one night and data would be lost. Someone on site may or may not spot that the data had actually gone missing. The probability of someone noticing a failure with a script is inversely proportional to the time that the shell script has been in place.

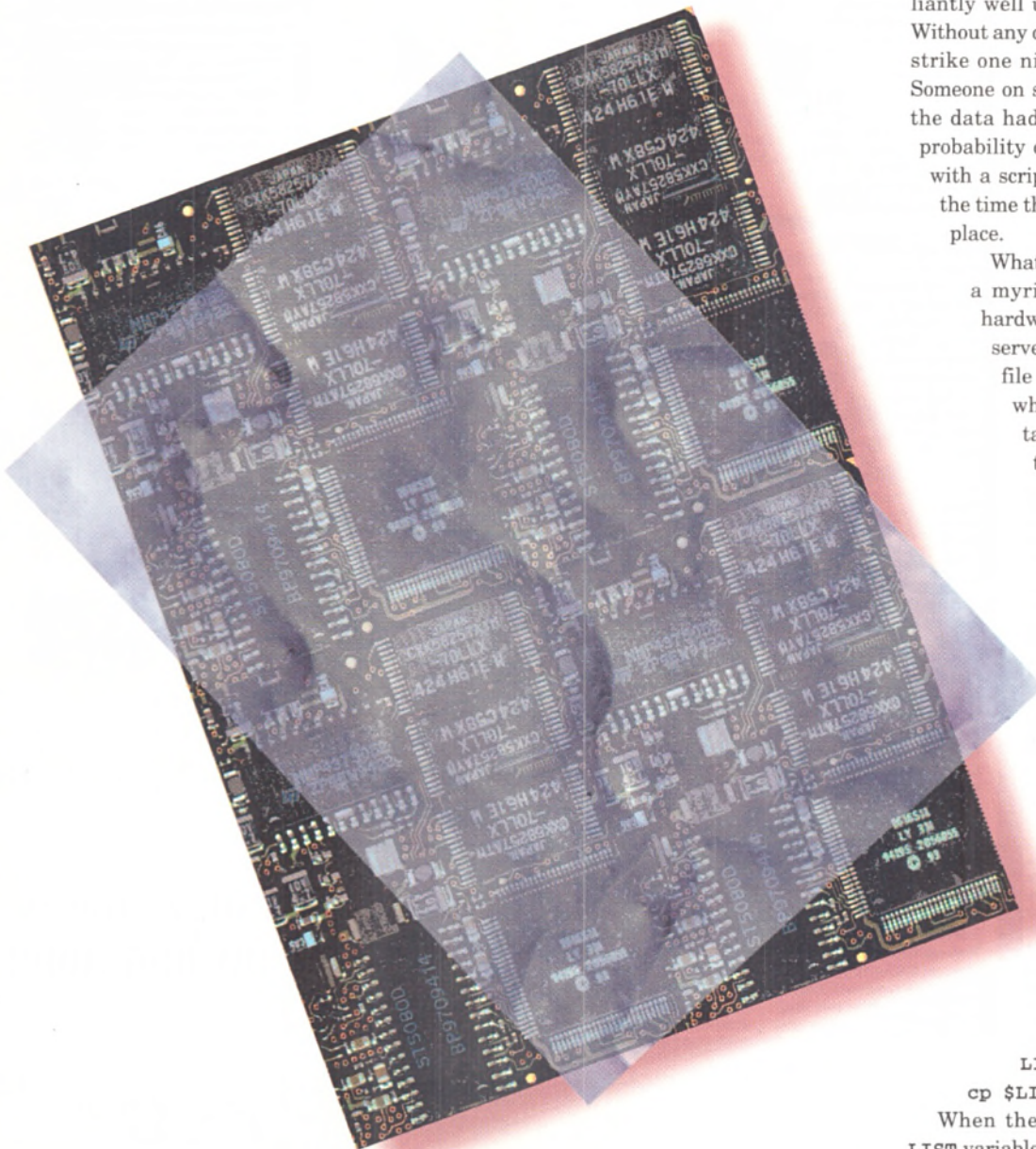
What can go wrong? Well, there are a myriad of things. There can be hardware failure in the client or the server. If NFS is being used, then a file system may not be mounted when it is needed. Perhaps the target file system is full. These things occur rarely, but they do happen.

A very subtle problem can result from the scaling of any solution. If we are moving many files, then we probably don't care too much about their names. We will go to some directory and do filename expansion using star or question marks to derive the list of files that needs to be worked on. Possibly we'll place the list into a variable, for example,

`LIST`, and write something like:

```
cp $LIST destination-dir
```

When the command is executed, the `LIST` variable expands to a full set of path-



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names and the files with those pathnames are copied to the destination directory. Using variables like this is very common, and we all do it.

The problem appears when the number of files in the `LIST` variable grows. The kernel will have a limit to the number of bytes that it is prepared to pass in an argument list across the `exec` system call. The value varies from system to system. The original V7 UNIX value was 10,000 bytes, on my BSD/OS system it's 20,480 bytes, it's 100,000 hexadecimal bytes on my Sun (SunOS or Solaris).

The limit is fine for most normal circumstances, it's designed to represent infinity. It is still a limit and sooner or later a script can cross the boundary from working to non-working. There's a chance that the script will fail safely and not do any damage. There's a better chance that horrible things will happen in a way that is not easily reproducible. After all, no-one ever thinks that the `exec` system call will fail.

Catastrophic events are somehow less of a problem when humans are driving a script by hand. They can see the unexpected error message, and deal with it. It may be confusing when a script called `backup` suddenly displays:

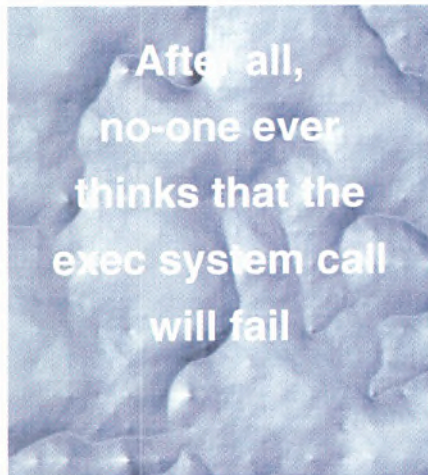
```
cp: no space left on device
```

but at least the `no space` part is comprehensible and can be acted on. It's still the case that humans need some support from the script. It's no use if the `cp` command in the script has failed with some error condition, and then the script has merrily gone on to delete the source files anyway.

Program status

UNIX provides us with a mechanism for determining whether a command has succeeded or not. Each command is supposed to return its status on exit. A zero value means success, and non-zero says that some problem has occurred. I say 'supposed' because we are at the mercy of the programmer. The program must include an explicit call to the `exit()` routine on termination to ensure that the returned status value makes sense.

The notion of program status was implemented by Steve Bourne when he was developing his shell. The story goes that he got everyone to toe the line about returning a status by printing a rude message whenever a command did not return a reasonable value. Most, perhaps all, of the standard commands do fit in with the scheme. There are deficiencies, for example, if you use `rsh` to execute a command on a remote machine then you cannot get the



status back from that remote command.

Assuming that each program is well behaved, we can expect it to return an exit status that we can use to see if the program succeeded or not. There has to be some rule that provides for single status to be returned from several commands connected in a pipeline. The rule here is that the last command in the pipeline provides the status to the calling shell.

A non-zero status will be returned if the program died because it received some signal. Signals are used to return various internal failures in the program like 'Segmentation fault' when a program steps illegally on its own address space. The process is sent a signal and the default action is to die. The reason for its death is placed in the status value, and normally the shell will decode that value to print a failure message to the user.

It's not too hard to examine the status value returned by a program. The `if` statement in the Bourne shell is designed to do the job.

```
if cp $src $dst
then
    : success
else
    : failure
fi
```

The `if` statement will execute the `then` branch if the command after the `if` returns zero status. The `else` branch is executed for any other values. The branches cannot be empty and I usually add the shell comment command – the colon. The colon behaves syntactically like a regular command name but all the text from the colon to the end of the line is ignored.

In addition to being able to directly test the value, the shell variable `$?` is set to the returned value of the last command that was executed. We can use the variable to check on the returned status using the `test` command. I generally use its alias `'t'`.

```
cp $src $dst
if [ $? -eq 0 ]
then
    : success
else
    : failure
fi
```

Here the `test` command (expressed as `'t'`) is used to see if the status variable `$?` is equal to zero. The `if` statement is working in exactly the same way as before, looking at the status returned by a command, in this case `test`. The `test` command returns zero if the condition expressed by its arguments is true and non-zero otherwise. Using `test` can be more flexible than using a command directly in an `if` statement, although I think that it sacrifices some readability.

You can use the `&&` and `||` operators to conditionally execute a command that follows them depending on the success or otherwise of the previous command.

```
cp $src $dst || echo failure
```

This sequence will execute the `cp` command and run the `echo` to the right of the `||` if the copy fails. The `||` operator means logical *or* in C, and it's being used similarly here. If the first command fails, then the second one is executed.

The sequence:

```
cp $src $dst && echo success
```

is the inverse of the one above. When the copy command succeeds, the commands to the right of the `&&` are executed. This is a logical *and*, if the first command fails, then the second command is not executed.

Shell syntax says that the text to the right of these operators can be a list. You need to beware of the precedence of the standard command separators, semicolon and ampersand. The syntax limits you to placing a single command in the list unless

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you group the commands in curly braces:

```
cp $src $dst || {
    echo Copy failed
    exit 1
}
```

I've taken to defining shell functions to output error messages, for example:

```
fatal() {
    echo 'cmd:' "$1"
    exit 1
}
...
cp $src $dst || fatal Copy failed
```

Checking on results

We can now copy files with some chance that we can detect an error in the command and take action in the script if the copy failed for some reason. We can stop the script and exit, shouting for help.

Perhaps we can use `mv` to move the files from one place to another. Using `mv` does have the benefit of making a single call to a program to move the file. Well, I feel queasy about moving files, call it paranoia if you like. I would rather not use an `mv` command in a script that is attempting to be robust. The `mv` command will hamper recovery and the script may not be restartable if things go wrong. I'd rather make a copy of the source files and explicitly compare the new copies against the old. If the compare succeeds, I know that the file is correctly in place and I can begin to feel happier about deleting the original files.

My copy script starts to look like:

```
# copy file
if cp $src $dst
then
    : success
else
    fatal Copy failed
fi
# check copy is complete
# -s says nothing,
# just return program status
if cmp -s $src $dst
then
    : success
else
    fatal Compare failed
fi
# remove the source
rm -f $src
```

In my production version, which deals with subtrees of files, I decided to complicate matters further by using `tar` to copy the subtrees and the files they contain. I used

If humans are to
run the script, then
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aspect of the
operation is easier
to manage

`tar` because I wanted to preserve the modification time on the files, and also copying a bunch of files in one command is somewhat more efficient than copying one file at a time.

My script uses `find` to create a list of all the files and directories to be copied. I then go through the list looking for directories and making sure that the target directory structure mirrors that of the source. It's also necessary to worry whether a directory in the source tree is actually a file in the target tree.

I check that the file has not been copied before, I don't want to overwrite anything that is safely on the host with what might be redundant data. I now use `tar` to copy the files:

```
(cd $srcdir; tar cf - $COPYLIST) |
    (cd $targetdir; tar xfp -
)
```

You can use `cpio` if it makes sense on your system. Of course, I have validated that both the source and destination directories exist and also used the `wc` command to ensure that the content of `COPYLIST` is not too large to be passed on the command line



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for the system running the script. I rely on the validation phase to pick up on any files that are not copied correctly and will abort file deletion if I get any mismatch.

Pulling or pushing

One decision that needs consideration is where the copy script is to be run. Do you run the script on the central server pulling files or do you place a copy on each of the remote workstations pushing the files onto the central server? I think that it depends on the degree of automation that you require.

If the script is to be run on demand by humans, then it's probably better for each workstation to be supplied with a copy of the script that can be run when the disk is full or the data is ready to be saved centrally. If humans are to run the script, then the 'get help' aspect of the operation is easier to manage, they will notice any failure output from the script and will be able to take any necessary steps to rectify the problem.

If the need is for full automation and the script is to be run regularly to move data, then the best place to put it is on the central server. Incidentally, if you are looking at the problem of files going from the central server to the workstation, then you need to check out the `rdist` program. It's designed to maintain workstation files based on one central master system.

However, I am thinking about automatically moving files to the server and placing a single script on a central server is a viable option. The server can have a list of workstations to inspect and can move files as needed. Again, the script can be executed on demand by a human or it can run from the clock using the `cron` program.

Running things from `cron` has its own set of pitfalls. First, you can develop a script that will run fine from your terminal but will fail when you attempt to run it from `cron`. One culprit can be `rsh`, you need to add the `-n` flag to a call to `rsh` otherwise it will probably hang.

There are some general considerations, you must ensure that you set up a `PATH` variable in the script. You should set `PATH` for all scripts in production use anyway, it's safer. It ensures that you are executing the programs that you think that you are using and not other versions possibly supplied by the user.

Second, when `cron` starts a script, the script will be running without the benefit of the environment variables that the `login` program and your shell start-up scripts work hard to provide. Also, the script won't be talking to a terminal. The `cron` daemon will usually start the job with standard out,



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each day

standard in and standard error channels all pointing at something. On my Sun, `cron` will point standard input at `/dev/null` and the other two channels are set to write to a file on `/tmp`. If the output file contains anything when the `cron` job terminates, it is sent to the user in the mail.

Everything's just fine

There is an interesting question about what can be done if things go wrong with the script that is run by `cron`. The last thing that anyone wants is to see some scruffy log that is sent to them by email each day. I cannot understand the people who want to be sent copious logs of what has happened on their system.

I believe that after just one week, the person who gets the mail is no longer reading it but is simply deleting it to reduce the load in his mailbox. As a result, he will miss that one day where things go wrong and no-one can understand why he missed the event. After all, he was being mailed the log.

Well, we should all try to be a little more clever. First, nobody needs to be told that things are working fine, unless they ask. Things working fine should be the default

state, and worry is not needed. The question is: how do we determine what and when things are 'working fine'. One answer is to make the script completely silent for normal operation. If the standard output and error channels are diverted to a file, a zero length output file means that things are okay. It's a simple test to detect a non-empty file and send mail to someone if the log contains anything.

Another alternative is to retain yesterday's output file and compare today's version with it, sending mail only when they differ. Checking on file differences *can* work, but it does mean that you only get an error warning once. When the error is also in yesterday's file, then the script stays silent. It also means that you need to be circumspect about what you write in the file, for example, you cannot date the log file unless you implement something to remove the dates before comparisons are made.

Of course, email may not be the only way of complaining from a script. You can get a message into the standard `syslog` mechanism using the `logger` command. The message can be made to appear on the consoles of a set of nominated users if they are logged in.

Warning messages should only be used in the direst emergency. Again, people will get used to a message that appears regularly and will ignore the messages that are really important. The mechanism needs backing up with something else. If the problem happens when no-one is logged in, then no-one will see the message because people are not often in the habit of looking at log files to check for errors or problems that occurred.

Finally

Don't be afraid to try several alerting schemes. Make sure you review whatever system you use to ensure that the need to react quickly in an emergency is not dulled by constant exposure to mundane trivia.

I hope that this article has made you worry a little about the scripts that you have installed on your system to do day-to-day tasks. It often doesn't take a lot longer to create a robust script that will survive unexpected events. If you only ever save one irreplaceable file then that time is not wasted. ■

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Part II

The Win32 API is not just for 32-bit applications.

Michael Marshall brings bits of Win32 within reach of lowly 16-bit applications.

Last month, I introduced the Common Code approach as a solution to platform chaos. To summarise, a Common Code application, through encapsulation and portable coding techniques, uses a single set of source code to provide native applications for Windows 3.x, Windows NT, and Windows 95. A real-world example is my Jot program, which started life as a Windows 3.x application and now targets all three Windows platforms quite easily.

One limitation of the Common Code approach that I mentioned last month is that an application can only use facilities available under *all* platforms. Threads and memory-mapped files, only possible under Win32, are out immediately, along with overlapped I/O, NT Security, and more. Although this keeps a lot of the Win32 API out of Common Code applications, there are a number of quite useful Win32 functions that can be used. To add a function to the list of facilities available to our Common Code, we just have to provide a Win16 implementation for that API function. This technique is what I will explain in the remainder of this article. The implementations for most of the functions to be discussed can be found in Listings 1 and 2.

My first example of 'back-porting' Win32 API functions is the standard error group: `GetLastError` and `SetLastError`. Both functions are very important for Win32 programming, since all API functions are supposed to use them to pass failure information back to the programmer.

These error functions only store and retrieve an error code, so the Win16 implementation consists of little more than a static variable, `errorCode`, to hold that value.

You will need to do some work to use this facility with Win16 applications, including Common Code applications. The Win32 API online help file documents over 200 error codes, which means there are probably 350 more error codes which are not documented. It is impractical to provide all of these codes for the Win16 implementation, so you should copy in those values that are used by your error-handling code. To improve the compatibility between the ANSI `errno` variable and the Win32 model, I have defined a new error code, `ERROR_ERRNO`, which informs the application that `errno` holds the actual error; this can be used within other functions that call ANSI functions.

It is unfortunate that `Get/SetLastError` was not introduced in Win16, as its consistent use within the Win32 API only highlights the lack of any analogous facility in the Win16 API (`errno` doesn't count). This is one of the few differences between Win16 and Win32 that cannot be easily addressed even with Common Code, and so this particular back-porting exercise is intended more to demonstrate the technique than to provide something to use in your application. A production Common Code application will probably need to shift the error-handling and

reporting burden to a platform-specific encapsulation facility.

Which Windows?

The basic technique should now be clear, so let us put it to use to implement another useful Win32 API function, `GetVersionEx`.

`GetVersionEx`, as the name suggests, is an extended version of the Win16 `GetVersion` API function. The newer version provides additional information about the operating system version (eg type of Win32 platform: NT, Windows 95, or Win32s). With Common Code applications, it is often useful to know what platform we are running on; for example, if the application knows it is running under Win32s, it can disable features not implemented such as communications.

The Win16 implementation of `GetVersionEx` uses the results of `GetVersion` to fill in most of the members of the `OSVERSIONINFO` structure (the MS-DOS information is ignored). Since there is no build number information available, the `dwBuildNumber` member will always be 1. The `dwPlatformId` member is assigned a new value, `VER_PLATFORM_WIN16`, indicating the Windows 3.x platform, or the Win16 subsystem of NT or Windows 95.

```
// win1632.h
// Useful Win32 structures/types for Win16
// Copyright (C) 1996 Michael J Marshall
// For EXE Magazine

#ifdef !defined(_WIN1632_H)
#define _WIN1632_H

#ifdef !defined(__TIME_H)
#include <time.h>
#endif

#ifdef !defined(_WIN32_)
// Win16 definitions:

// SYSTEMTIME structure and its functions
typedef struct _SYSTEMTIME {
    WORD wYear;
    WORD wMonth;
    WORD wDayOfWeek;
    WORD wDay;
    WORD wHour;
    WORD wMinute;
    WORD wSecond;
    WORD wMilliseconds;
} SYSTEMTIME;
typedef SYSTEMTIME FAR *LPSYSTEMTIME;

void GetSystemTime(LPSYSTEMTIME lpTime);
void GetLocalTime(LPSYSTEMTIME lpTime);

// OSVERSIONINFO structure and its functions
typedef struct _OSVERSIONINFO {
    DWORD dwOSVersionInfoSize;
    DWORD dwMajorVersion;
    DWORD dwMinorVersion;
    DWORD dwBuildNumber;
    DWORD dwPlatformId;
    char szCSDVersion[128];
} OSVERSIONINFO;
typedef OSVERSIONINFO FAR *LPOSVERSIONINFO;

BOOL GetVersionEx(LPOSVERSIONINFO lpVerInfo);

#define VER_PLATFORM_WIN32S 0
#define VER_PLATFORM_WIN32_WINDOWS 1
#define VER_PLATFORM_WIN32_NT 2

// Error reporting
DWORD GetLastError(VOID);
VOID SetLastError(DWORD);

// Include a few representative error codes
#define NO_ERROR 0L
#define ERROR_SUCCESS 0L
#define ERROR_FILE_NOT_FOUND 2L
#define ERROR_BAD_LENGTH 24L
#define ERROR_INVALID_PARAMETER 87L
// There are lots more - insert what you need...

#endif // !_WIN32_

// And now define a value for Win16 which
// probably won't conflict with future MS values
#define VER_PLATFORM_WIN16 1001

// This error code says to use the ANSI errno
// value for information.
// Primarily for use under Win16.
#define ERROR_ERRNO 9999L

// Here are some helper functions to convert
// between Windows SYSTEMTIME and ANSI
// time_t/struct tm objects. They are available
// to Win32 applications as well as Win16 ones.
// NB These functions assume that the
// tm/SYSTEMTIME sources represent LOCAL time.

void AnsiToWinTime(SYSTEMTIME &dst, time_t src);
time_t WinToAnsiTime(const SYSTEMTIME &src);
void FillWinTime(SYSTEMTIME &dst,
    const struct tm *src);

#endif
```

Listing 1 – WIN1632.H

Besides portability, using `GetVersionEx` on all platforms has other benefits, such as avoiding potential errors through misinterpretation of `GetVersion` results.

Time

Another feature common to many Windows applications is the use of time. If you want to take the easy route, the ANSI date/time functions (`time`, `gmtime`, `localtime`, and `strftime`) are already available on all Windows (and UNIX) platforms thanks to your compiler. In general the ANSI solution works, but implementations are generally dependent on environment variables (eg `TIMEZONE`) or special libraries; if something is missing or incorrectly configured, the results can be problematic at best.

Windows NT and 95 have built-in knowledge of timezones, and the Win32 API includes a number of API functions for processing date and time which are similar to the ANSI functions. The next target for Win16 porting will be some of these Win32 date and time functions.

Common Code applications should use the Win32 date and time functions instead of the ANSI functions wherever possible. The main justification for this is the reduced potential for errors if `TIMEZONE` is undefined or incorrect.

Unfortunately, the Win16 implementation of these Win32 functions will need to use the ANSI functions, but that's only a problem for the Win16 version of the application. Another justification is that under Win32,

the date/time functions reside in system DLLs, not your application code.

There are two data types used by the Win32 functions, `SYSTEMTIME` and `FILETIME`. `SYSTEMTIME` is equivalent to the ANSI `tm` structure, which makes it quite easy to implement under Win16. `FILETIME` holds a 64-bit integer value representing the time elapsed since 1 Jan 1601 in 100-nanosecond units (1 nanosecond is 1 billionth of 1 second). Unfortunately, 64-bit integers are non-standard, which means implementing them when in Win16; I didn't have enough time and space for this article, hence those Win32 API functions using `FILETIME` are left as an exercise for the reader.

Two straightforward Win32 functions implemented for Win16 are `GetSystemTime`

```
// win1632.cpp
// Copyright (C) 1996 Michael J Marshall. For EXE Magazine

#include <owl/owlpch.h>
#pragma hdrstop

#include "win1632.h"

#if !defined(__WIN32__)

void GetSystemTime(LPSYSTEMTIME lpTime) {
    PRECONDITION(lpTime);
    if (!lpTime) return; // No point in setting SetLastError
    time_t clock = time(0);
    struct tm *t1 = gmtime(&clock);
    FillWinTime(*lpTime, t1);
}

void GetLocalTime(LPSYSTEMTIME lpTime) {
    // Where code is omitted (...)
    // full source is available by FTP
    // ...
}

BOOL GetVersionEx(LPOSVERSIONINFO lpVerInfo) {
    PRECONDITION(lpVerInfo);
    if (!lpVerInfo) {
        SetLastError(ERROR_INVALID_PARAMETER);
        return FALSE;
    }
    if (lpVerInfo->dwOSVersionInfoSize != sizeof(OSVERSIONINFO)) {
        SetLastError(ERROR_BAD_LENGTH);
        return FALSE; // Invalid size
    }
    DWORD dwVersion = GetVersion();
    lpVerInfo->dwMajorVersion = LOBYTE(LOWORD(dwVersion));
    lpVerInfo->dwMinorVersion = HIBYTE(LOWORD(dwVersion));
    lpVerInfo->dwBuildNumber = 1; // No info available
}
```

```
lpVerInfo->dwPlatformId = VER_PLATFORM_WIN16;
// This is a Win16 application
strcpy(lpVerInfo->szCSDVersion, "Windows 3.x");
return TRUE;
}

#endif // __WIN32__
// The remaining functions are available for both Win16 and Win32

// PRECONDITION: SRC is valid and consistent, with all members in range
// We could remove this condition by using mktime/localtime to normalise
void FillWinTime(SYSTEMTIME &dst, const struct tm *src) {
    // Fills SYSTEMTIME struct with data from src
    // ...
}

void AnsiToWinTime(SYSTEMTIME &dst, time_t src) {
    FillWinTime(dst, localtime(&src));
}

// PRECONDITION: ST holds a time >= 1 Jan 1970 00:00
time_t WinToAnsiTime(const SYSTEMTIME &st) {
    // Converts Win32 time struct to ANSI format
    // ...
}

// Error handling

#if !defined(__WIN32__)

static DWORD errorCode = 0;

DWORD GetLastError(VOID) {
    return errorCode;
}

VOID SetLastError(DWORD ecode) {
    errorCode = ecode;
}

#endif
```

Listing 2 - WIN1632.CPP

```
// locale.h Locale information for Win16/Win32
// Copyright (C) 1996 Michael J Marshall. For EXE Magazine

#if defined(_U_LOCALE_H)
#define _U_LOCALE_H

#if defined(__CSTRING_H)
#include <cstring.h>
#endif

#if !defined(_U_WIN1632_H)
#include "win1632.h"
#endif

class TULocale {
public:
    typedef bool (*EnumProc)(const char *format, void *context);
    static bool bMetric; // True if measurement system is metric
    static char timeFormat[2][20]; // 0=w/o seconds, 1=w/seconds
    static char dateFormat[2][32]; // 0=short date, 1=long date
    static char ampm[2][5]; // 0=AM, 1=PM
    static bool useLongDate; // Default format for formatDate()
    static bool timeSeconds; // Display seconds in the default time format
    static char listSeparator; // List separator character
    static char timeSeparator; // Time separator character
    static char currency[5]; // Symbol for the currency
    static int numberDigits; // Digits after the decimal point, number
    static int currencyDigits; // Digits after the decimal point, currency
    static bool leadingZero; // Display leading zero (0.7 or .7)
}
```

```
static char decimal; // Symbol separating integer and fraction

public:
    static void refresh(); // Loads/reloads the locale information
    static string dayName(unsigned n); // Returns the locale-specific name of the day, n=0..6
    // NB returns string for MT-safety
    static string monthName(unsigned n); // Returns the locale-specific name of the month, n=1..12
    // NB returns string for MT-safety
    static string formatTime(const SYSTEMTIME &st, const char *format = 0); // Formats the given time as a string. If format is not specified,
    // the user's locale default is used.
    static string formatDate(const SYSTEMTIME &st, const char *format = 0); // Formats the given date as a string. If format is not specified,
    // the user's locale default is used.
    static void enumDateFormats(EnumProc proc, bool longFormats, void *context = 0); // Enumerates available date formats - NOT MT-Safe
    static void enumTimeFormats(EnumProc proc, void *context = 0); // Enumerates available time formats - NOT MT-Safe

private:
    // You cannot create instances of this class
    TULocale();
    ~TULocale();
    TULocale(const TULocale&);
    void operator=(const TULocale&);
};

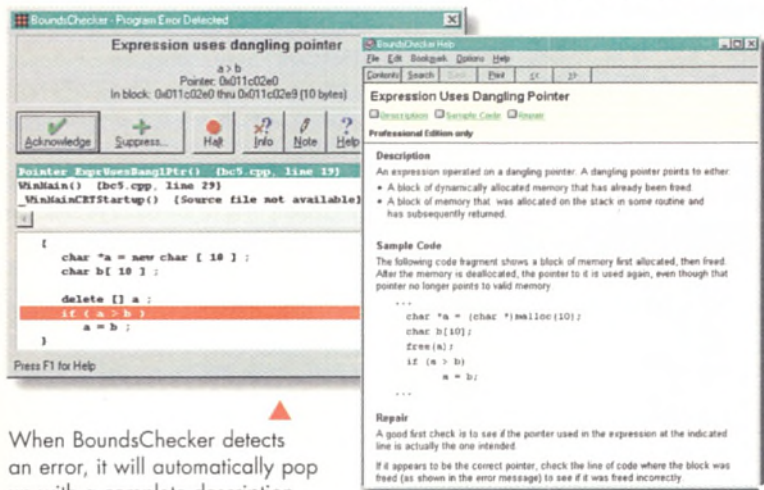
#endif // _U_LOCALE_H
```

Listing 3 - LOCALE.H

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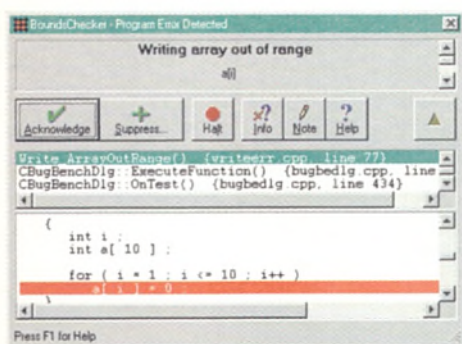
◀ In this example, a block of memory was allocated and then freed. The pointer was referenced again, but the memory was no longer valid. An error results.

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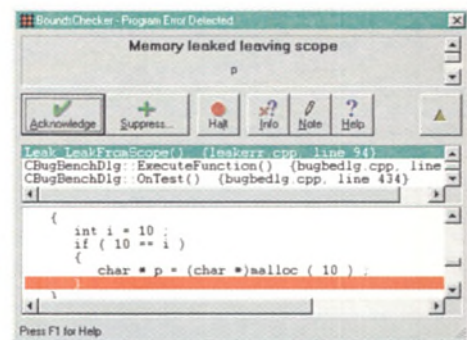
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◀ Here the array has a range of 0 to 9 rather than 1 to 10. As a result, some piece of memory would have been overwritten leading to unpredictable behavior.

Here memory was not freed before leaving the function, resulting in a memory leak. BoundsChecker detects this error instantly, because as soon as the function ends, it knows the leak has occurred. As a result, the problem is identified as it happens!



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BoundsChecker Professional Pack	NT & 95
BoundsChecker Standard Pack	NT & 95
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and `GetLocalTime`. `GetSystemTime` is implemented using time to get the current time, `gmtime` to convert it into a `tm` structure, and `FillWinTime` to map the `tm` members into `SYSTEMTIME` members; `GetLocalTime` is implemented in an identical fashion. There are a couple of limitations in the Win16 versions: the `wMilliseconds` member of `SYSTEMTIME` is always zero (which might be rectified using `GetTickCount`), and since ANSI times are restricted to the years 1970-2038, so is `SYSTEMTIME`.

The source code includes some helper functions for converting between `time_t` and

`SYSTEMTIME` objects; these are available to Win32 applications as well. There is more to say about date and time operations, but first some internationalisation issues.

July 4th or April 7th?

Internationalisation is a major issue for software, especially here in Europe. Different countries can have different rules for formatting information such as dates, time, numbers, and currency. If an application displayed dates in US format, an English person could easily misinterpret the information (and vice versa). It is therefore essential that applications dis-

play such information either in a locale-neutral format ('10-Dec-66' is unambiguous), or in the user's preferred format.

Windows, thankfully, offers quite a lot of support for multiple locales. Both Win16 and Win32 versions store date, time, number, and currency formats for the use of applications.

A Win16 program retrieves this locale information directly from the WIN.INI file using `GetProfileString` or `GetProfileInt`, specifying 'Intl' as the section to search through. There is not very much information on using this locale data, so I have summarised the contents of [intl] in Table 1.

```
// locale.cpp
// Copyright (C) 1996 Michael J Marshall. For EXE Magazine
#include <owl/owlpch.h>
#pragma hdrstop
#include <stdio.h>
#include <string.h>
#include <owl/profile.h>
#include "locale.h"
bool TULocale::bMetric = true;
char TULocale::timeFormat[2][20] = { "HH:mm", "HH:mm:ss" };
char TULocale::dateFormat[2][32] = { "dd-MMM-yy", "dd MMM yyyy" };
char TULocale::ampm[2][5] = { "am", "pm" };
bool TULocale::useLongDate = false;
bool TULocale::timeSeconds = true;
char TULocale::listSeparator = ',';
char TULocale::timeSeparator = ':';
char TULocale::currency[5] = "$";
int TULocale::numberDigits = 2;
int TULocale::currencyDigits = 2;
bool TULocale::leadingZero = false;
char TULocale::decimal = '.';
void TULocale::refresh() {
    TRACE("TULocale::refresh");
}
#ifdef __WIN32__
char buf[10];
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_IMEASURE, buf, 2);
bMetric = (atoi(buf) == 0);
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_STIMEFORMAT,
    timeFormat[0], sizeof(timeFormat[0]));
strcpy(timeFormat[1], timeFormat[0]);
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_S1159, ampm[0],
    sizeof(ampm[0]));
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_S2359, ampm[1],
    sizeof(ampm[1]));
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_SSHORTDATE,
    dateFormat[0], sizeof(dateFormat[0]));
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_SLONGDATE,
    dateFormat[1], sizeof(dateFormat[1]));
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_SLIST, buf,
    sizeof(buf));
listSeparator = buf[0];
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_SDECIMAL, buf,
    sizeof(buf));
decimal = buf[0];
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_SCURRENCY,
    currency, sizeof(currency));
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_ICURRDIGITS,
    buf, 3);
currencyDigits = atoi(buf);
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_IDIGITS, buf, 3);
numberDigits = atoi(buf);
::GetLocaleInfo(LOCALE_USER_DEFAULT, LOCALE_ILZERO, buf, 2);
leadingZero = (atoi(buf) != 0);
#else
TProfile ini("Intl");
bMetric = (ini.GetInt("iMeasure", 0) == 0);
ini.GetString("sShortDate", dateFormat[0], "dd-MMM-yy");
ini.GetString("sLongDate", dateFormat[1], "dd MMM yyyy");
int iTime = ini.GetInt("iTime", 0);
int iTLZero = ini.GetInt("iTLZero", 0);
char buf[10];
ini.GetString("sTime", buf, sizeof(buf), ":");
timeSeparator = buf[0];
ini.GetString("sList", buf, sizeof(buf), ",");
listSeparator = buf[0];
ini.GetString("sDecimal", buf, sizeof(buf), ".");
decimal = buf[0];
ini.GetString("sCurrency", currency, sizeof(currency), "$");
currencyDigits = ini.GetInt("iCurrDigits", 2);
numberDigits = ini.GetInt("iDigits", 2);
leadingZero = (ini.GetInt("iLZero", 0) != 0);

ini.GetString("sTime", sTime, sizeof(sTime), ":");
// NB Windows will set this empty if 24-hour time is used.
// This of course makes it more difficult to use 12-hour time
ini.GetString("s1159", ampm[0], sizeof(ampm[0]), "am");
ini.GetString("s2359", ampm[1], sizeof(ampm[1]), "pm");

// Build the time format strings
```

```
char *p1 = timeFormat[0], *p2 = timeFormat[1];
char h = iTime ? 'H' : 'h';
*p1++ = *p2++ = h;
if (!TLZero) *p1++ = *p2++ = h;
strcpy(p1, sTime);
strcpy(p2, sTime);
// p1/p2 are now null-terminated strings
strcat(p1, "mm");
strcat(p2, "mm");
// Append seconds to 'long' time format
strcat(p2, sTime);
strcat(p2, "ss");
if (!iTime) {
    // Append am/pm
    strcat(p1, "tt");
    strcat(p2, "tt");
}
}
#endif
string TULocale::dayName(unsigned n) {
    PRECONDITION(n < 7);
    if (n > 6) return "iDAY";
    string result;
#ifdef __WIN32__
    char buf[20];
    if (n == 0) n = 7;
    int rc = ::GetLocaleInfo(LOCALE_USER_DEFAULT,
        LOCALE_SDAYNAME1+n-1, buf, sizeof(buf));
    WARN(rc==0, "GetLocaleInfo error: " << GetLastError());
    result = buf;
#else
    static const char *names[7] = {
        "Sunday", "Monday", "Tuesday", "Wednesday",
        "Thursday", "Friday", "Saturday"
    };
    result = names[n];
#endif
    return result;
}
string TULocale::monthName(unsigned n) {
    // As above, but retrieves month name
    // ...
}
static void appendInt(string &dst, unsigned n, int width = 0) {
    char buf[10];
    // sprintf doesn't support * in format specifiers!
    sprintf(buf, "%0*u", width, n);
    dst += buf;
}
string TULocale::formatTime(const SYSTEMTIME &st, const char *format) {
    string result;
#ifdef __WIN32__
    char buf[32]; // arbitrary size, hopefully larger than required
    DWORD flags = 0;
    if (!format && !timeSeconds) flags = TIME_NOSECONDS;
    int rc = ::GetTimeFormat(LOCALE_USER_DEFAULT, flags, &st,
        format, buf, sizeof(buf));
    WARN(rc==0, "GetTimeFormat error: " << GetLastError());
    result = buf;
#else
    if (!format) format = (timeSeconds ? timeFormat[1] :
        timeFormat[0]);
    CHECK(format);
    register const char *fp = format;
    while (*fp) {
        switch (*fp) {
            case '\\':
                if (*++fp == '\\') result += *fp++;
                else while (*fp) {
                    if (*fp == '\\')
                        if (*++fp != '\\')
                            break;
                    result += *fp++;
                }
                break;
            case 'h': {
                // 12-hour clock
                WORD hour = st.dwHour % 12;
                if (hour == 0) hour = 12;
                if (!strncmp(fp, "hh", 2)) {
                    appendInt(result, hour, 2);
                }
            }
        }
    }
}
```


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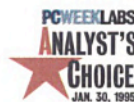
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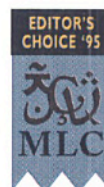
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A Win32 program uses the `GetLocaleInfo` API function to retrieve locale information from the Registry. While `GetLocaleInfo` is cleaner than accessing the Registry directly for this information, you can only retrieve information as text; you will need to use `atoi` to extract an integer value.

Since the two APIs vary significantly, access to the locale information will be encapsulated within a generic interface: the `TULocale` class (see Listings 3 and 4). `TULocale` is an example of an interface class which cannot be instantiated and whose methods and members are all static. I chose this model for `TULocale` because there is no requirement for more than a single instance of locale information within an application.

For this article, I have only stored a selection of locale items in `TULocale`; you can add and remove items to fit your requirements. The items defined include list and time separators, date and time formats (used in the next section), and some number and currency formatting information. On startup, the static variables are assigned default values using US defaults. A call to `TULocale::refresh` during application initialisation (`TApplication::InitInstance` is the best place for this) loads the user's locale information into the variables. The Win16 version of this code simply retrieves values from `WIN.INI`, while the Win32 version makes calls to `GetLocaleInfo`. The time formats have to be inferred under Win16, so part of the refresh

code builds the time formats from other locale information available.

The `dayName` and `monthName` functions will retrieve the locale-specific name of the weekday or month. The Win32 version calls `GetLocaleInfo`, since Win32 does provide this information for us. For Win16 it simply returns the appropriate English name, as unfortunately locale-specific names do not appear to be accessible via a public interface. This limitation can easily be removed by providing a new implementation that retrieves the names from a `STRINGTABLE`, keyed to the language code.

The locale information needs to be refreshed whenever the user modifies the international settings. When this happens,

```

        fp += 2;
    }
    else {
        appendInt(result, hour);
        ++fp;
    }
}
break;
case 'H':
    // 24-hour clock
    if (istrncmp(fp, "HH", 2)) {
        appendInt(result, st.wHour, 2);
        fp += 2;
    }
    else {
        appendInt(result, st.wHour);
        ++fp;
    }
    break;
case 'm':
    if (istrncmp(fp, "mm", 2)) {
        // Minutes, leading zero
        appendInt(result, st.wMinute, 2);
        fp += 2;
    }
    else {
        // Minutes, no leading zero
        appendInt(result, st.wMinute);
        ++fp;
    }
    break;
case 's':
    if (istrncmp(fp, "ss", 2)) {
        // Seconds, leading zero
        appendInt(result, st.wSecond, 2);
        fp += 2;
    }
    else {
        // Seconds, no leading zero
        appendInt(result, st.wSecond);
        ++fp;
    }
    break;
case 't':
    if (istrncmp(fp, "tt", 2)) {
        // Time marker
        result += TULocale::ampm[(st.wHour < 12)? 0 : 1];
        fp += 2;
    }
    else {
        // Time marker
        const char *tmp = TULocale::ampm[(st.wHour < 12)? 0 : 1];
        result += tmp[0];
        ++fp;
    }
    break;
default:
    result += *fp++;
}
}
return result;
}

string TULocale::formatDate(const SYSTEMTIME &st, const char *format) {
    // As formatTime
    // ...
}

// Used by enumDate/TimeFormats
static TULocale::EnumProc enumProc = 0;
static void *enumContext = 0;
#ifdef __WIN32__
BOOL CALLBACK LocaleEnumDateCallback(LPTSTR format) {
    PRECONDITION(format);
    PRECONDITION(enumProc);
    return enumProc(format, enumContext);
}
#endif

void TULocale::enumDateFormats(EnumProc proc, bool longFormats, void *context) {
    PRECONDITION(enumProc == 0);
    PRECONDITION(proc);
    enumProc = proc;
    enumContext = context;
#ifdef __WIN32__
    BOOL rc = ::EnumDateFormats(LocaleEnumDateCallback,
        LOCALE_USER_DEFAULT,
        longFormats? DATE_LONGDATE :
        DATE_SHORTDATE);
    WARN(!rc, "EnumDateFormats error: " << ::GetLastError());
#else
    static const char *sFormats[] = {
        "dd-MM-yy",
        "d/M/yy",
        "MM/dd/yy",
        "dd-MMM-yy",
        "dd MMM yy",
        "ddMMMyyy",
        "yyMMdd",
        "ddMMyy",
        "MMddyy",
        0
    };
    static const char *lFormats[] = {
        "dd MMMM yyyy",
        "d MMMM yyyy",
        "MMMM d, yyyy",
        "ddd, d MMMM yyyy",
        "dddd, MMMM d, yyyy",
        0
    };
    const char **fp = longFormats? lFormats : sFormats;
    while (*fp) {
        if (!enumProc(*fp, enumContext)) break;
        ++fp;
    }
    enumProc = 0;
    enumContext = 0;
}

void TULocale::enumTimeFormats(EnumProc proc, void *context) {
    PRECONDITION(enumProc == 0);
    PRECONDITION(proc);
    enumProc = proc;
    enumContext = context;
#ifdef __WIN32__
    BOOL rc = ::EnumTimeFormats(LocaleEnumTimeCallback,
        LOCALE_USER_DEFAULT, 0);
    WARN(!rc, "EnumTimeFormats error: " << ::GetLastError());
#else
    static const char *tFormats[] = {
        "HH':'mm':'ss",
        "HH':'mm",
        "HHmm",
        "h':'mm':'ss' 'tt",
        "hh':'mmt",
        "HH.mm",
        0
    };
    const char **fp = tFormats;
    while (*fp) {
        if (!enumProc(*fp, enumContext)) break;
        ++fp;
    }
    enumProc = 0;
    enumContext = 0;
}
}

```

Listing 4 – LOCALE.CPP (Continued)

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Bibliography and resources

PSS Q58337 – Windows 3.0 WIN.INI [intl]
Section (23 Nov 94) One of the few pieces of documentation relating to the Windows 3.x locale information. It's written for Windows 3.0, but also appears to be accurate for Windows for Workgroups 3.11 as well.

Windows 3.1 SDK Help The topic 'International Applications' provides some information on [intl].

Win32 SDK Help Documentation for the Win32 API functions discussed in this document, and the definition for their behaviour.

All the source code referenced in this article is available by ftp at <ftp://ftp.exe.co.uk/pub/exestuff/winport>, on Cix or by postal mail (send an SAE labelled 'WinPort' to EXE Editorial).

the application's main window will receive the **WM_WININICHANGE** message; at this time, a call to **TULocale::refresh** will re-load the locale information.

Formatting date and time

Now I wish to return to the Win32 date and time functions, and link that topic with the **TULocale** class. We want to be able to display dates and times in a format chosen by the user, either through the Control Panel (the default) or through an application dialog.

Under Win32, we can use the **GetDateFormat** and **GetTimeFormat** functions to translate **SYSTEMTIME** structures into text representations, using special formatting codes. For example, the date format 'dd MMM yyyy' represents strings of the form '04 Jul 1996', while the time format 'hh:mm tt' can give us '09:43 pm'. You can give these API functions explicit formats or tell them to use the user's locale defaults.

The Win16 API does not have similar functions. In general, the Win16 API provides locale information, but no functions to help use that information.

To port **GetDateFormat** and **GetTimeFormat** to Win16, we could use the same interface (ie parameters) for the Win32 version, but since some of these parameters (eg the locale identifier) are meaningless under Win16, we would be better off providing a new generic interface. The result is **formatDate** and **formatTime**, which are static methods of **TULocale**. They take a **SYSTEMTIME** and an optional format string, and return the formatted result. The Win32 implementations map directly to **GetDateFormat** and **GetTimeFormat**. The Win16 implementations just iterate through the format strings, replacing valid codes (eg 'MMM', 'hh') with the appropriate values:

```
char buffer[64];
SYSTEMTIME now;
GetLocalTime(&now);
GetDateFormat(LCID_USER_DEFAULT,
              DATE_LONGFORMAT,
              &now, 0, buffer,
              sizeof(buffer));
GetTimeFormat(LCID_USER_DEFAULT,
              DATE_SHORTFORMAT,
              &now, 0, buffer,
              sizeof(buffer));
```

The last two date and time API functions we will look at are **EnumDateFormats** and **EnumTimeFormats**, which iterate through locale-specific lists of date and time formats. These functions permit an application to build lists of format strings to present to the user for selection.

TULocale provides an interface to these functions, **TULocale::enumDateFormats**

and **TULocale::enumTimeFormats**. These versions have an additional optional parameter which an application can use to pass arbitrary data through to the call-back functions, such as a dialog or window handle.

The Win16 versions of these enumerators use internal static lists which provide formats suitable for most locales. On my system (NT 3.51sp2), the Win16 version actually provides a more useful list than the native Win32 enumerators, which only displayed a couple of variations on the same format. You may wish to consider storing the format lists in a **STRINGTABLE**, or even provide an interface for the user to modify the format lists.

The LocaleTest sample

All of the facilities discussed in this article are demonstrated in the **LocaleTest** application. This is available by FTP or on disk from EXE (see box above left). All of the code was developed using Borland C++ 4.53 with the OWL library. The code is portable to other C++ compilers. ANSI C++ compilers that support **bool** and **string** will have the easiest time of it. The demonstration programs are very OWL-specific, but implementing them using MFC or even straight C/C++ should not be difficult.

With this approach there is not a single line of platform-specific code in it, even though we are using functions such as **GetVersionEx** which are nominally Win-32 only. This application compiles without modification to a Win16 or Win32 executable. The output does vary on each platform (especially the version information and date/time formats), but this is to be expected.

The more platforms, the merrier

All of the techniques discussed in this article and the previous part are based on my experience with the **Jot** application. Much of the source code presented was taken from **Jot**'s source or derived from it. I really wish I could have just ported **Jot** to Win32 and dropped Windows 3.x, but the market (and the users) said 'No'. So I had to redesign the application into its present form, and improved my skills in creating portable code. Until the market adopts Win32 completely, many other developers will be doing the same.

With the right tools and techniques, developing applications that support a range of platforms can be no more difficult than supporting one platform. ■

When he's not writing articles for EXE, developing Jot, or living Dilbert, Michael J Marshall is a software engineer for Connection Software in North London. Michael writes in C/C++ under Windows and UNIX. He can be reached by email as michael@xon.co.uk, and on <http://www.compulink.co.uk/~unicorn/>.

Name	Default	Description
iCentury	0	If 1, indicates that the century should be displayed in short dates.
iCountry	1	Numeric country code, same as the telephone prefix (eg 44 for UK). Canada is 2, not 1.
iCurrDigits	2	Number of decimal places in currency.
iCurrency	0	Currency format: 0=£N; 1=£N; 2=£ N; 3=£ N
iDayLZero	0	If 1, displays day with leading zero in short dates.
iDigits	2	Number of decimal places in numbers.
iLZero	0	Leading zeros: 0=7; 1=0.7
iMeasure	1	Units of measure: 0=metric; 1=Imperial
iMonLZero	0	If 1, displays month with leading zero in short dates.
iNegCurr	0	Formats negative currency: 0=(£N); 1=-£N; 2=£-N; 3=£N-; 4=(N£); 5=-N£; 6=N-£; 7=N£-
iTime	0	If 1, uses 24-hour clock
iTLZero	0	If 1, displays leading zeros in time
s1159	AM	Time marker for 00:00-11:59
s2359	PM	Time marker for 12:00-23:59
sCountry	United States	Name of the locale's country
sCurrency	\$	Currency symbol
sDecimal	.	Punctuation between integer and fractional parts of a number.
sLanguage	usa	Specifies 'name' of language.
sList	,	Separates items in a list.
sLongDate	dddd, MMMM d, yyyy	Long date format picture.
sShortDate	M/d/yy	Short date format picture.
sThousand		Separate groups of digits in numbers
sTime	:	Separates hours, minutes, seconds in times

Note: an 'i-' prefix to the name indicates an integer value, an 's-' prefix indicates a string value.

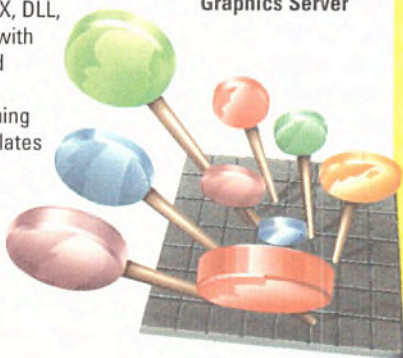
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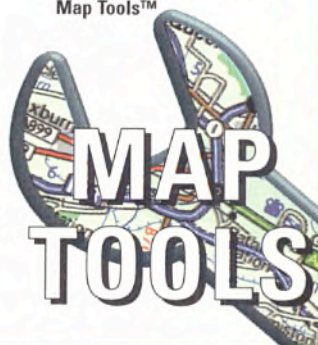
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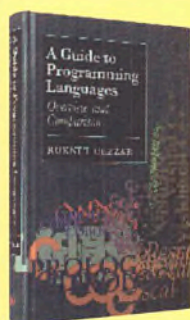
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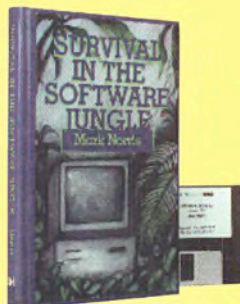
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CIRCLE NO. 581

Using new bottles

When changing language, programmers want to bring along as many of their old idioms as possible.

Francis Glassborow explains why this is not always a good idea.



Many programmers have problems when moving to a new language. If they find that the new language allows them to use an old idiom, they do not stop and examine the consequences in the new environment. On the other hand, if the new language does not support the old idiom they are likely to blame the language, calling it inadequate, badly designed etc.

The essential ingredient for successful use of idioms is to understand what they are for. If you just copy a language idiom blindly you will find it very difficult when you change languages. If you understand what you are trying to achieve, you will usually find what you need. If you do not, then you will need to dig in to understand the new language better.

Let us look at a very simple example, that of implementing the concept of a manifest constant. Remember that this idea was first introduced by assembler level programmers to make their code more readable. The idea is to remove 'magic numbers' by providing values through a name.

The C solution

Most C programmers use the pre-processor to fix this problem. The following is the standard C method:

```
#define PI 3.1415926
```

In effect it is an instruction to the pre-processor to substitute 3.1415926 for all appearances of **PI** in the code. The method relies on the programmer's understanding of the implications and can cause a few problems, such as when using debuggers. However, in the context of pure C written by experienced programmers, it works well.

The C++ version

C++ relies on scope in ways that were never envisaged by the designers of C. C++ is carefully designed to meet the needs of what I call distributed coding. That is, an executable may use the work of many programmers who are working independently. If they understand what they are doing, they can encapsulate almost all their identifiers in appropriate scopes. Unfortunately, the pre-processor does not take scope into consideration. A single, ill considered, pre-processor directive can shoot someone else's code. Another feature is that C++ makes much use of type for such things as function and operator overloading. The use of casts in **#define** can provide type information, but their use would be unusual in C.

Very early on Bjarne Stroustrup included features in C++ to help reduce the use of the pre-processor. Unfortunately many programmers moving to C++ do not understand this and continue to use the C mechanisms. Mostly it works, but such code is defective and when it fails the programmer will be left with a debugging nightmare. If only they would learn to rewrite their manifest constants as in the following example:

```
const double pi = 3.1415926;
```

Use uppercase if you must, but do use **const** types for your manifest constants in C++. This method provides the type information C++ may need and respects both scope and the work of other programmers.

If you need a sound, compatible method for C and C++ then you can get away with using an **enum** for integer constants. The **const** route does not work in C if you need a compile time constant.

Another C++ problem

C tolerates global variables. It requires all global variables to be statically initialised (implicitly to zero unless the programmer provides a compile time value), ie the value must be available at compile time and must not rely on any user provided code. This is too restrictive for C++ where user-defined types may have user-written constructors, ie C++ global variables may have to be dynamically initialised. User-written code can depend on other values which may themselves come from dynamically initialised variables. Everything is fine as long as the problem is confined to a single file. Where more than one file is involved we are subject to the whims of the linker, and we cannot currently determine the order of initialisation for globals defined in different files. The simple answer is to avoid globals. Interestingly, we can do this in C++ by encapsulating global objects in functions. For example:

```
Mytype & Global() {
    static Mytype mt; // line A
    return mt;
}
```

The first key is line A. The rules for **static** declarations is that the variable is initialised



the first time the path of execution passes through it. Subsequently that line will be skipped. In real life, `mt` will probably call a constructor that takes some arguments. The second key to the method is returning a reference. This means that `Global()` can be used in all places where a variable of `Mytype` can be used.

With this slightly weird idiom, the point of initialisation of `mt` is determined by the flow of your program. It will necessarily be initialised at the point of first use. If that initialisation depends on some other variable, its initialisation will be forced to occur before the initialisation of `mt`.

Manifest constants in Java

Many Java programmers will come from the C/C++ community. Some of them are going to be puzzled by the lack of a pre-processor coupled with the absence of `enums` and of global variables. It may take them some time to realise that all they need to do is to use a class. For example:

```
class Constants {
    public static final double pi = 3.1415926;
    // other numerical values such as phi etc.
}
```

Now anywhere you need to use `pi`, you just write `Constants.pi`. Once you understand how this works, you will find implementing a replacement for `enum` straightforward.

Last month's problems

Taking the second problem first.

How many errors are there in the following C++ code?

```
#include <iostream.h>
int main() {
    int i=10;
    i = i->i(); // line A
    cout << i << endl;
    return 0;
}
```

As I write this column before the previous one is published I have no idea what you

have found. Line A is clear nonsense. I think there are three errors, but I will settle for one. I will not settle for a compiler that ignores the line without warning. Visual C++ 4.0 does that. This kind of fault shakes my faith in the compiler. If it does this, what else is it doing? I find it hard to believe that this is an isolated freak. I think there must be a serious flaw in the parser.

This is not the only problem with Visual C++ 4.0. Microsoft's implementation of the `using` directive for namespaces is wrong. What it has done is what most members of WG21/X3J16 thought was right until last June. However Microsoft participates in X3J16 and so should know the understanding that resulted from an electronic seminar during mid-June last year. Six months is enough time to correct a compiler that has been designed with object-oriented technology.

When are corporate users going to start demanding higher quality? Individuals can be excused for being dazzled by good marketing, but corporates should be more perceptive. Do not blame Microsoft, it is just responding to the demands of the market place. In a sense, you are all getting what you deserve.

Back to the first problem

What algorithm should you use to select a small random sample from a large population, even if your pseudo-random generates many repeats.

The algorithm I used last month is inappropriate because it requires storage for every member of the source population. Even if you have storage for a million numbers, initialising such storage is inefficient.

Given a suitable random number generator (ie one with sufficient range of values) the simple solution is to select a number and test it against the set of already selected numbers (the first selection will be free). If you find it duplicated, select again and repeat the tests. Repeat this procedure until you have the required set. When selecting a small sample from a large population you will usually find that this works in a reasonable time. But there is always the risk of a pathological instance. The larger the proportion of the population the higher the risk of duplicates delaying completion, or even locking up. If this puzzles you, think about using this method to select 999999 items from a million. Is there a way to select a sample from a large population without ever having to re-select and with no more storage than that to store the sample?

To keep things simple, imagine that you want to choose six numbers from twenty (1 to 20). Assume that you have already chosen five numbers from 19 (1 to 19). Now all you need to do is to select one more. Generate a random number in the range 1 to 20. Test to see if it is one of the five that have already

been chosen. If it is, choose 20 instead, else use the random number. This means that there are six chances of choosing 20, one in its own right and five as a substitute for duplicating one of the five already selected. At worst you must make one call to the random number generator and five comparisons. Now, all you have to do is to choose five numbers from 19 in the same way.

Stepping back through the sequence we find that we must first choose one from the first 15, then one from the first sixteen substituting 16 if our second choice duplicates the first. And so on till we choose the last from all twenty. At each stage we deal with a duplicate by replacing it with the largest number available at that stage (which cannot have been chosen previously because it was not available earlier)

This algorithm has a predictable worst case that is independent of the size of the population from which you are selecting. If you want to choose a set of n you will need to make n calls to the random number generator and a maximum of $n(n-1)/2$ comparisons. You need n units of storage.

I am indebted to Jon Jagger for reminding me of this algorithm which was discovered by Bob Floyd (a Turing Award winner) and published by Jon Bentley. You can find it in *More Programming Pearls*, a collection of Jon Bentley's columns from *Communications of the ACM*. This and the preceding *Programming Pearls* should be required reading for all programmers.

This month's problem

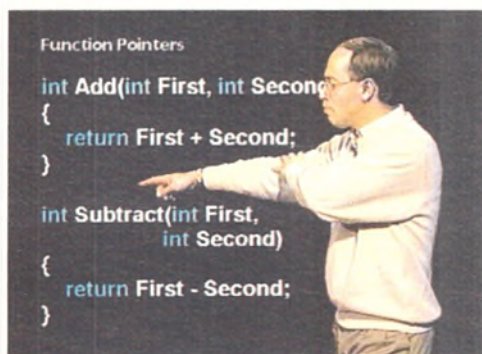
You wish to use `qsort()` to order an array of objects of type `T`. You need to write a compare function to implement whatever ordering rule you are going to impose. What should your code be up to the second semicolon? If you think you do not have enough information then you are probably one of the majority of programmers who do not know how to write a compare function for `qsort()`.

Finally

Why do so few of you investigate membership of ACCU? Judging by my experiences when presenting C++ training every C and C++ programmer would profit from membership. Finding out more about ACCU only takes a letter, an email message or a telephone call. ■

Association of C/C++ Users subscriptions: individual £14, student £7, corporate £75, Overload & C++ SIG £15 (+ ACCU membership). For further information about ACCU write to Francis Glassborow, 64 Southfield Road, Oxford, OX4 1PA, ring 01865 246490 or email (without contents) info@accu.org.

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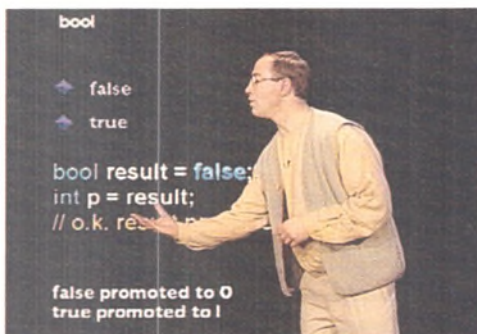
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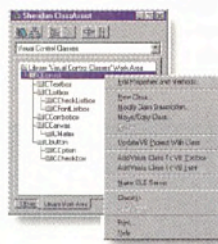
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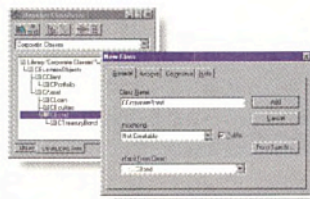
For example, to use a timer Oblet from within a class:

```
Dim MyTimer as New ssTimer
MyTimer.Interval = 250 'milliseconds
MyTimer.Connect Me, "Alarm" 'calls the 'Alarm'
                          'method of your class
                          'when the timer expires
                          'starts the timer

MyTimer.Enabled = True
```



- The heart of the ClassAssist IDE is the Class Explorer. It shows the relationships between all classes in the current library in an easy to read outline view
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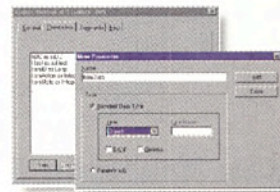


- The ability to create a new class that inherits functionality from an existing class makes you more productive and encourages code reuse
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Installing on the cheap

Do you need to pay £200 and up to get a good Windows installation package?

Michael J Marshall says 'No!', and shows that good software *does* come cheap.

Like many developers, when I had my application ready to ship, help file spell-checked, README.TXT referring to the current version, etc I was faced with the problem of getting the product installed on the user's system? In earlier versions I just put the instructions in the README.TXT, but that is hardly helpful, is it? So I looked at the specs of some of the major installation kits talked about on Cix and the Internet.

The Wise Installation System was frequently mentioned with lots of favourable comments, so I downloaded the shareware version. Unfortunately, at £149 for a license, it was a too expensive for my requirements – I would need to sell eight licenses of my £20 shareware program just to pay for the installer.

The Win32 SDK (as well as the Microsoft and Borland compilers) includes a special version of Stirling InstallSHIELD, another well-received installation package. It's 'free' once you buy the SDK or compiler of course. I thought it might do the trick. Then I looked through the on-line help and the examples, and ran for cover. InstallSHIELD is not for the faint of heart, and in my opinion requires far too much work to create an installation kit just to copy a handful of files. Another deficiency is that the SE version distributed with the SDK only supports 32-bit installations; my product needs to be installed on Windows 3.x as well. Stirling's full kit does



Sergei Gagarin

support Windows 3.x, but costs around £500, which is way out of my league. For more information on the Wise and InstallSHIELD installation packages, Dave Jewell reviewed them (in some depth) in the November and December 1995 issues of *EXE*.

Another problem with both packages is that they would have added quite a lot of overhead to my distribution in the form of the installer binary and support files; in the world of shareware, 200 KB can make the difference between an application being downloaded or ignored.

Not only the developer of shareware/free-ware software has a need for cheap installation package. For instance, the in-house developer or the support team might need to distribute a new Delphi or Visual Basic applet they have written to colleagues (or clients) who are less than computer literate. They want a small installation kit so it can fit on a single floppy, but it cannot be expensive because they do not have the budget. Where can you find a cheap, usable installation package

which will not bloat your package? The answer is *shareware*.

Shareware installers

The shareware method of distribution (which can be summarised as 'Try before you Buy') works extremely well for installation packages. You can download a number of alternatives from the Internet, Cix, or CompuServe, and give them all a run-through for the cost of on-line time. One package will probably take your fancy and meet your requirements, so you register it. That is much more difficult to do with commercial packages ('Buy before you Try').

Some of the terminology I will use in this article should be defined now: An *installation kit* is what you give the user to install an application on a computer; it may be .ZIP file or a floppy disk. An *installer* is the program (usually called either INSTALL.EXE or SETUP.EXE) which controls the installation process, usually by processing an *installation script* (often called SETUP.INF). An *installation package* is an application that is used to create the installation kit which will contain the installer and (usually) the installation script.

For this review, I downloaded a number of shareware installation packages, and have selected six of these for comparison.

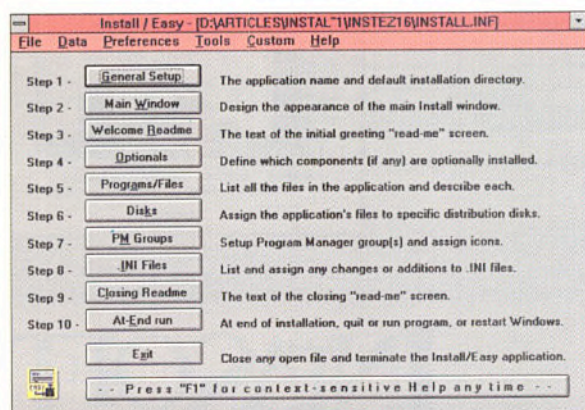
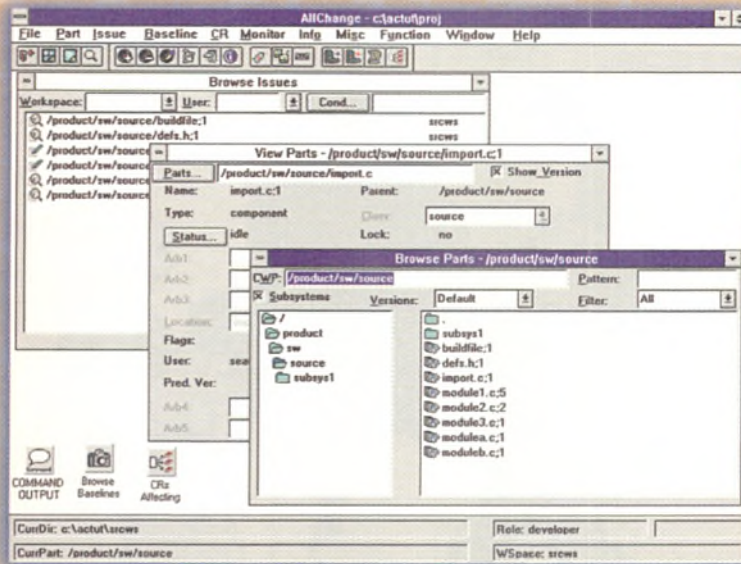


Figure 1 – Install/Easy's creation editor

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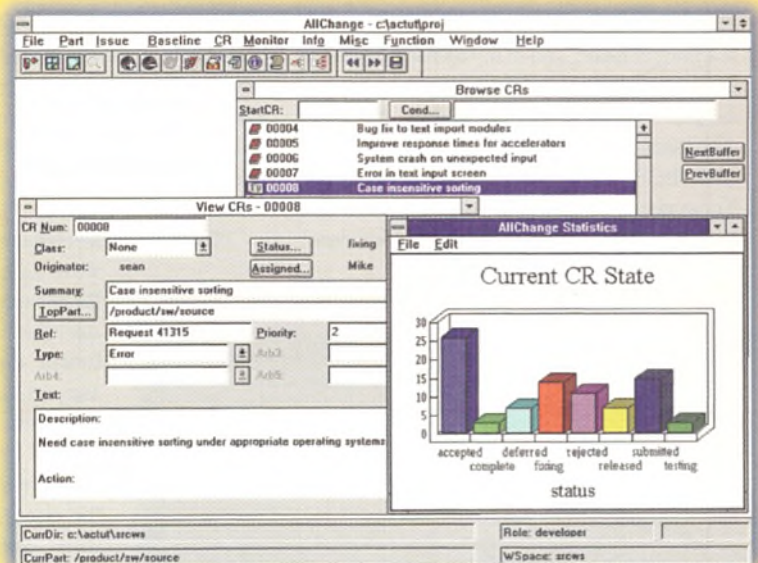
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VERSION 3.2



The capabilities of these packages range from very simple no-frills installations to full-featured installations which rival the more expensive commercial packages. As for price, the most expensive package reviewed costs less than £35.

To test out these packages, I created installation kits for the 16-bit and 32-bit versions of my shareware program, Jot. Both versions require application files to be copied to the user's chosen directory, and the 16-bit version requires CTL3DV2.DLL to be installed into the Windows SYSTEM directory if not already present. Finally, Program Manager items need to be created for the application and help file. The intention is not to stress the installation packages, but to use them in a common real-world task for a small application.

The packages reviewed here are: Install/Easy 1.6, Phillips Install Maker 1.0, Freeman Installer 2.2c, O'Setup 2.1, YAWPI 1.2, and SVInstall 3.13. At the time of writing, these were the most current versions I could find on the Internet; newer versions may have been released in the interim which address any deficiencies noted here and add new features. See the table *Contact information* to find out where to download them from. All the packages tested are Windows 3.x applications. They all run correctly under Windows NT 3.51sp2, but of course you will not be able to take advantage of long filenames or the Registry.

Install/Easy 1.6

The Install/Easy package, written by Kurt Herzog, is just what the name suggests: a

small, simple installation package. The installation kit is created and modified through an editor (see Figure 1), which lists each step required to define your kit. You just follow the instructions, and in a few minutes you can have a basic installation kit ready for distribution.

The installation kit can support a language other than English by selecting an option when building the kit, and including the appropriate language DLL. Most European languages are supported, which is good news for EU developers, but for other languages (such as Japanese), you should contact the author for availability.

Install/Easy is not as full-featured as some other packages in this review, but I had no difficulty in creating my application's installation kit, which is among the smaller at 537 KB for Windows 3.x. If you are developing for Windows 95, Install/Easy does not include an uninstall facility, a requirement for the Windows 95 logo.

Other features of Install/Easy let you define up to three optional component groups, set the timestamp on application files, and let you modify the look of the installer background (text, font, colour, location).

Registering Install/Easy costs \$29.95 (£20), which makes it one of the cheapest packages reviewed, but you will have to pay via US\$ cheque/money order or CompuServe SWREG, as the author does not accept credit cards.

Phillips Install Maker 1.0

If you need to install a very small package (say under ten files), and you do not have any unusual requirements, then Phillips Install Maker should be considered.

The interface is very simple (see Figure 2). You add files to a list, make a couple of choices about what to call the installation and where the default directory is, and press

a button to make your installation kit. Unlike all the other packages in this reviews, Install Maker creates a single executable file, INSTALL.EXE, containing the entire kit. For in-house distributions, a single-file installation kit can be quite useful – the user launches it and the installation begins, no fiddling with PKUNZIP. If you plan to upload the kit to a BBS or FTP site, you will probably have to Zip it, as few sites accept executable archives these days because of virus risks.

On the down side, you cannot save what you enter into Install Maker's interface, which is a nuisance for all but the smallest installations. The installer does not seem to understand sub-directories (eg c:\alpha\betaeta), so your application will have to be installed in a top-level directory. There is no on-line help.

Install Maker has a registration fee of \$25 (£16). Most of the other packages reviewed are cheaper and have greater functionality, but Install Maker can generate a simple ready-to-ship kit faster than all the others. The author only accepts cheques or money orders.

Freeman Installer 2.2c

The large size of the Freeman Installer package (1.26 MB) might make you hesitate to download it, but you would be missing one very powerful installation package. A product of TipTec Development in Australia, Freeman Installer is probably the most fully-featured package in this review.

The core of the product is the Constructor application, which provides an interactive environment for creating and modifying installation kits; like with a number of the other reviewed packages, you cannot easily modify installation kits by hand. To use the package, you are very strongly advised to read through the four tutorial files provided. The tutorials are in Windows Write format

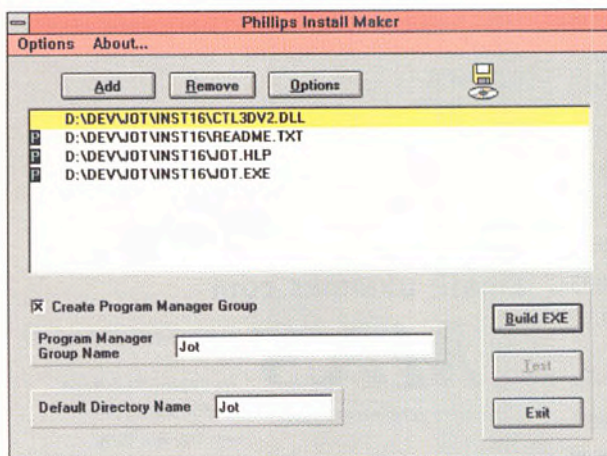


Figure 2 – Phillips Install Maker screen shot

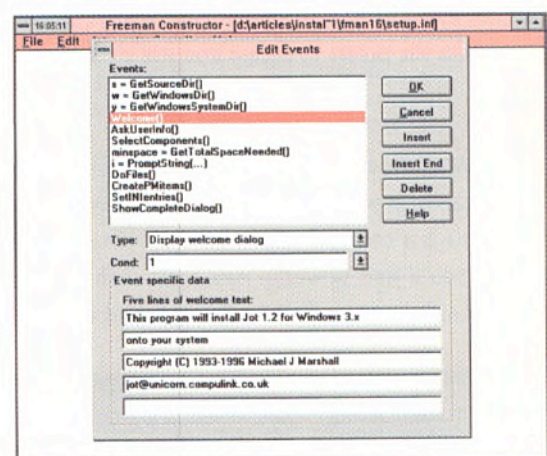


Figure 3 – Freeman Installer's events dialog

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and contain plenty of annotated screen shots to guide you step-by-step through creating increasingly complex installation kits. Unfortunately, while the tutorials were very useful, the on-line help is quite sparse, and fails to document sufficiently many features, especially details about the various commands available.

Like most installation packages, you define the elements of your installation, which files go where, and what Program Manager items to create. Freeman Installer supports drag-and-drop in most of its dialogs, allowing you to drop files from the File Manager, or to re-order items in list boxes. You can customise almost every facet of the installation through the events dialog (see Figure 3), which allows you to edit the installation script. Freeman Installer's scripts support variable assignments, string and integer expressions, conditional execution, and commands for accessing and modifying the environment. Even the most complex installations can be built.

One of the problems with many installation packages is the size of the installer programs, where you may need 300 KB of executables and DLLs just to prompt for a directory and copy a few files into it. Freeman Installer can create two types of installers – interpreted and compiled. The interpreted installer is generic and works like other installers and processes the installation script. A compiled installer is much more interesting. When you ask Freeman Installer to create a compiled installation kit, it generates a C++ source file containing code equivalent to the interpreted installation

	Install/Easy	Install Maker	Freeman Installer	O'Setup	YAWPI	SVInstall
Price (US\$)	29.95	25.00	30.00	50.00	29.00	42.95
16-/32-bit	16	16	16	16	16	16/32
Kit size (16-bit)	537 KB	566 KB	549 KB	558 KB	433 KB	489 KB
Registration methods	Cheque, MO, SWREG	Cheque	Cheque, MO, CC, SWREG	Cheque, MO, CC	Cheque, MO, CC	Cheque, MO, SWREG
Support options	e-mail	e-mail	e-mail, WWW	e-mail	e-mail, FTP, WWW	e-mail
Package size	661 KB	197 KB	1.26 MB	442 KB	126 KB	195 KB
Uninstaller			✓			
GUI tools	✓	✓	✓	✓		✓
Multi-lingual	✓		✓			
Compression	Windows	Windows	ZIP	Windows	AR	Windows
Tutorial			✓			
File timestamps	✓			✓		
Component sets	✓		✓	✓		
Modify AUTOEXEC.BAT, CONFIG.SYS			✓	✓		
Modify WIN.INI, SYSTEM.INI	✓		✓	✓	✓	
Modify REG.DAT	✓		✓	✓		

Table 1 – Installer features

script, and invokes your compiler (Visual C++ 1.5 or Borland C++) to build a dedicated installer for your kit. Among the advantages of using a compiled installer is that it is smaller (about 100 KB savings in Jot's case), there is no installation script which can be hacked or damaged, and it is faster.

Freeman Installer does not use the standard Microsoft compression engine for compressing files, opting instead for Info-ZIP compression, which gives compression better than COMPRESS.EXE and closer to that of PKZIP. For on-line distribution, you won't see much benefit (it will be Zipped after all), but a disk-based distribution will require less space (and fewer disks) than one using COMPRESS.EXE. These compressed files are readable by ZIP tools such as WinZip.

Another major feature of Freeman Installer is an uninstall facility which you can optionally enable in your installation kit. The uninstaller has a few nice touches, such as giving the user a list of what it is about to

do and allowing him to edit that list before continuing. If the user terminates an installation before completion, the uninstaller (if used) will be invoked, allowing the user to undo the installation so far; this is a very user-friendly facility, and a requirement for Windows 95 applications desiring the Microsoft logo. Finally, the installer can support multiple languages (one at a time), including Japanese.

Surprisingly, Freeman Installer is only \$30 (£20) for an author license, which is an incredibly good price for a product with these specifications. With a feature set rivalling the 'big boys', you would be mad to shell out £150 plus for a commercial package without evaluating this one first.

O'Setup 2.1

O'Setup, by Celtech Software of California, uses the Wizard paradigm now familiar to Windows 95 users. Unfortunately and confusingly, O'Setup's Wizard does not provide

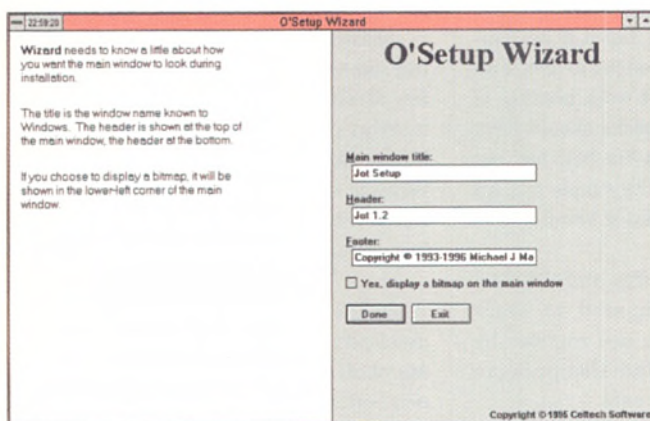


Figure 4 – O'Setup's no turning back Wizard

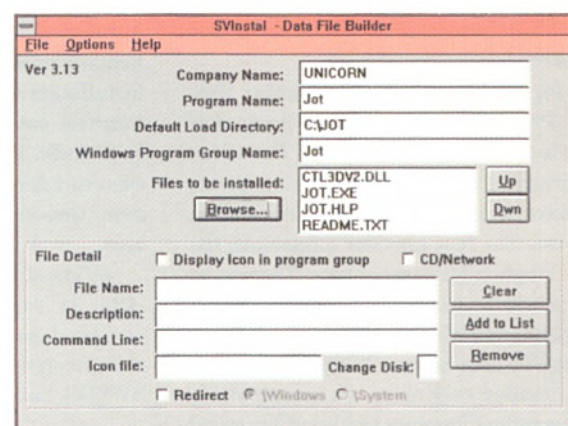


Figure 5 – SVInstall's user interface

Install/Easy	Kurt P Herzog, 1440 NE Tenth Street, Grant Pass OR 97526 USA 72122.2023@compuserve.com ftp://www.winsite.com/pc/win3/uttl/instez16.zip
Phillips Install Maker	Edward Phillips, 234 Central St Suite 8, Newton MA 02166, USA 73632.1521 @compuserve.com ftp://www.winsite.com/pc/win3/uttl/pinst102.zip
Freeman Installer	TipTec Development, GPO Box 712, Broadway NSW 2007, Australia freemant@wr.com.au http://www.netnet.net/users/freeman ftp://www.winsite.com/pc/win3/uttl/fi22c.zip
O'Setup	Celtech Software, 16900 Crenshaw Blvd #7, Torrance CA 90504 USA seano@netcom.com ftp://www.winsite.com/pc/win3/uttl/osetup21.zip
YAWPI	Right To Left Software, 3332 Yonge Street #94034, Toronto, Ontario M4N 3R1, Canada +1 416 489 7440, Fax +1 416 489 6654 info@rtlsoft.com http://www.rtlsoft.com ftp://src.doc.ic.ac.uk/pub/packages/simtel/win3/install/yawpi12.zip
SVInstall	Soft Ventures, Box 22183 Bankers Hall, Calgary, Alberta T2P 4J5 Canada stevensr@cadvision.com ftp://src.doc.ic.ac.uk/pub/packages/simtel/win3/sysutil/svi313c.zip

Table 2 – Contact information

the interface you expect with a proper Wizard. You create an installation kit by progressing through a series of dialogs (Figure 4), entering files and prompt information as you go. Unlike proper Wizard dialogs, you cannot backtrack to change or review earlier options, which can be quite a pain. When you get through to the end, the O'Setup Wizard compresses and copies your files into a directory for you to put on disk or into a ZIP file.

If you want to modify the installation script at all, you cannot use the Wizard; you have to modify the script file manually. The script language is quite straightforward, but you lose the benefits of syntax checking. Besides the usual file copying and .INI modifications, installation scripts can also unpack ZIP files. There is no foreign-language support, but there are tools for setting file timestamps and splitting large files to fit on disks. An unusual feature of O'Setup is the ability to access user-provided functions in a DLL, which allows the developer to perform additional installation tasks not possible in O'Setup.

At \$50 (£33), O'Setup is more expensive than other packages, but does not have a feature set to match. You can register by cheque, or by credit card with PsL (this incurs a surcharge).

YAWPI 1.2

YAWPI, which stands for Yet Another Windows Program Installer, is the product of Right to Left Software in Canada. There is no user interface to create installation scripts in, you have to provide two script files for the installer. The first provides commands, the other Program Manager entries. There is no on-line help file, just a text file referencing the commands available to scripts.

YAWPI does not use Windows compression, instead relying on an incompatible scheme using a freeware archive utility called AR (similar to the Unix tool). You compress files by storing them in archives created with AR. You cannot put files for the WINDOWS

or SYSTEM directory into the same archive as other application files, because the commands for unpacking archives cannot unpack files into multiple directories trees (ie files for \a and \a\b can be in one directory, but not files for \c\d and \e\f).

The installation script uses aliases \$d for the destination directory and \$w for the WINDOWS directory, but there is not a similar alias for the SYSTEM directory, which has implications for Windows NT and shared network installations. Other common features such as component groups are not supported.

You can register YAWPI for \$29 (£19), or \$79 (£52) to get the full source code, credit cards accepted. YAWPI is very basic, but it did produce the smallest installation kit of all the packages reviewed, about 56 KB smaller than the second-place package.

SVInstall 3.13

SVInstall, by Canadian firm Soft Ventures, is distributed as a Windows 3.x installation package, but registered users receive NT and Windows 95 versions, permitting platform-specific installation kits to be created; it is the only package reviewed which has a 32-bit version.

There is a user interface for defining the installation kit (Figure 5), but it is not particularly robust and allowed me to create an installation which did not work because of incorrect entries; more checks should have been made. There is an on-line help file, but even so I found creating the simple test kit more time-consuming than it should have been.

SVInstall has few features, and at \$42.95 (£28) is expensive compared to other reviewed packages. You can register by cheque, money order and CompuServe SWREG, but not by credit card.

Comparing them all

To conclude the review of these packages, I have compiled a table summarising some of



the features of each package (see Table *Installer features*). Facilities shared by all reviewed packages, and those you would rarely use, are not listed. Regarding the forms of payment accepted: all authors accept cheques and Money Orders (MO) in their native currencies. Those who accept credit cards (CC) accept at least Visa, MasterCard and Access. The SWREG option is only available to CompuServe members. With this option the price of the shareware is debited directly on the member's CompuServe bill.

With each package I created an installation kit for Windows 3.x and Zipped it up, ready to upload to an FTP site. The Kit size row in the table summarises the sizes of these kits. In general, smaller is better, but the features of the installer also need to be taken into account.

To locate any of these packages or to contact their authors, Table 2 provides mail and email addresses, phone numbers, and any URLs I could find. Most of the packages are available on the WinSite (CICA) FTP site and any of its mirrors (<ftp://src.doc.ic.ac.uk> is the main UK mirror).

Which is the best shareware installer? There is no quick answer for that. The one that is best for you is the one that meets all of your requirements, and this article should give you some entries for your own shortlist. I have reviewed only six packages here, and there are more on my disk that did not get into this article.

Overall, there are two packages in this article that should be on everyone's shortlist: Install/Easy and Freeman Installer. The former is well-suited for creating a simple installation kit quickly, and the latter gives you a lot of power for complex installations.

Shareware developers have been producing some great programs over the years, a few of which can compete with larger commercial ventures on a feature-for-feature basis. Don't ignore a software package because it is not distributed by the traditional retail channel: you may be ignoring just the package you are looking for. ■

When he's not writing articles for EXE, developing Jot, or living Dilbert, Michael J Marshall is a software engineer for Connection Software in North London. Michael writes C/C++ under Windows and UNIX. He can be reached by e-mail as michael@xon.co.uk, and his homepage is <http://www.compulink.co.uk/~unicorn/>.

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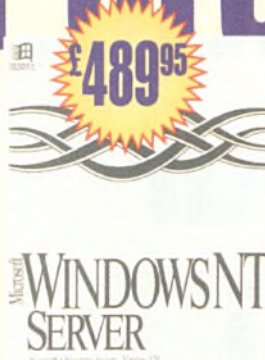
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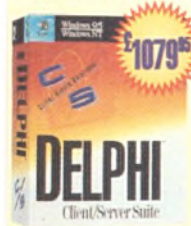
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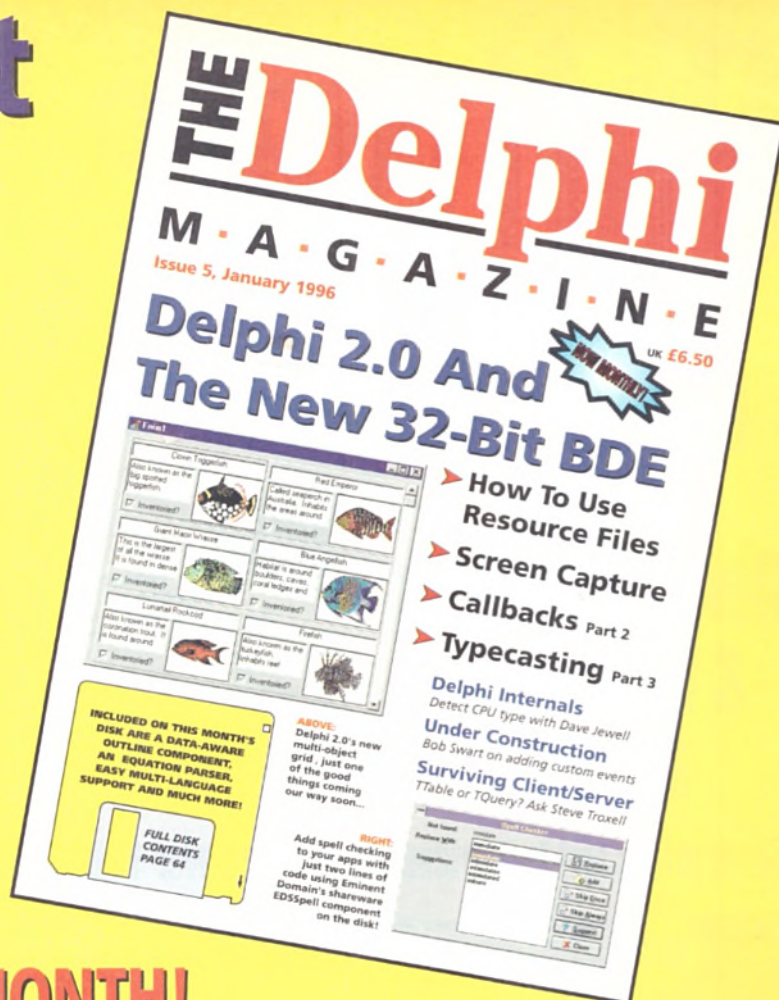


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Expert Assistance

Visual Basic is great for rapid application development, but it's not the easiest environment to maintain other people's code in. **Neil Hewitt** looks at a tool which aims to make life for the VB developer a little easier.

The Visual Basic (VB) developer's life is not always a happy one. VB is suited to rapid application development (RAD), but when applications begin to grow larger it can be difficult to see the whole picture; even more so when many programmers are working on the same project. Managing a large VB project between a team of programmers can be almost as time-consuming as writing the whole application from scratch in C++. Plus, when a new programmer has to take over someone else's VB project, he will have to inherit a complex series of notes and records made over the course of the project – assuming there are any. Either way there will be a significant acclimatisation period while the new developer gradually finds his way around the whole project.

Visual Expert Developer Edition (VE-D), from Visual Software Engineering (VSE), aims to change all that. The package was conceived specifically as a support tool for Visual Basic, and works with VB 3.0 and 4.0 projects. It is a Win32 application which runs under Windows 95 NT, or Windows 3.11 with Win32s installed. Although VE-D itself is 32-bit, you can use it to work on 16-bit VB 3.0 projects. VE-D consists of three major parts: the Visual Basic Analyst, the Bug Tracker, and the Traceability Expert. All work in a similar



fashion and together simplify the task of writing a large Visual Basic program. Once you've got used to the terminology which VE-D employs (see 'A Visual Expert glossary') it quickly becomes easy to use. The Visual Basic Analyst is the first tool you'll use when deploying VE-D in a real-life VB project. Before you can work with the Analyst, you must create a VE-D module which references a VB project file. You can specify any custom attributes you want the module to have at this point, and it's worth bearing in mind that this is the only place where you can do this, so plan ahead. When you create the module, VB Analyst generates an image file of the whole project including code modules and forms together with DLLs, OCXs and other external components referenced. It is from this image file that the Analyst does its stuff. I felt that this was good from a security point of view as it leaves your VB files untouched unless you choose to let VE-D comment your source code (of which more later).

Consulting the Analyst

The main display of the Analyst is a two-dimensional tree-structured diagram (see Figure 1), listing the component parts of the

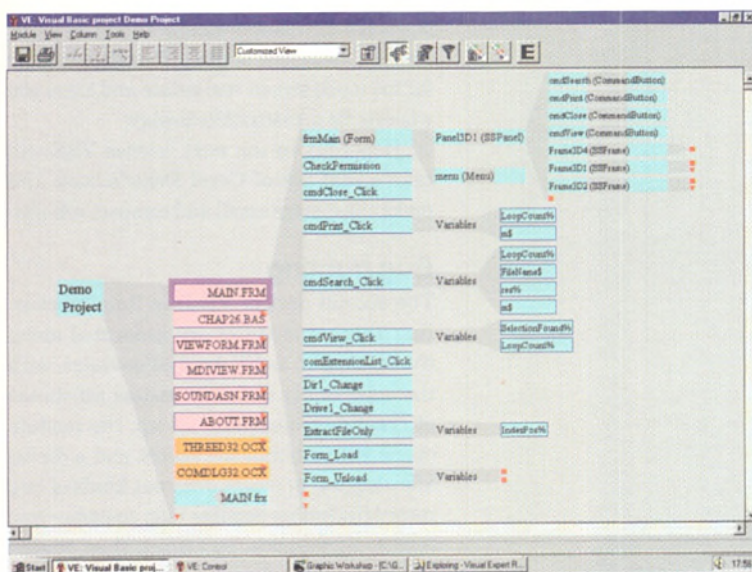


Figure 1 - VB Analyst: the branches can be expanded or collapsed

project (forms, modules, OCXs, etc) in a hierarchical format. The tree only shows a minimal amount of information to begin with, but clicking on an item expands all branches from that point. Items are colour-coded, with extra symbols used where necessary, so that you can easily track down the object you want. You can enable graphical links which trace a visible path between components calling or depending on each other. I found that this cluttered up the display, and when not needed I switched it off. In fact, in order to use VB Analyst fully I would recommend that you have a display resolution of at least 1024x768 and a 15" monitor: there's a lot of information to pack into a relatively small space, especially as the Analyst always tries to scale the tree so that it fits on screen.

Double clicking on an object brings up its Visual Basic Element dialog: here you can set basic attributes such as whether the element has been tested and/or completed, the completion date, and so forth. A text box displays information about the object, depending on its type. If you select a subroutine the box displays the parameters it takes and any comments placed at the head of the subroutine, for example. You can also view and edit the user-defined attributes you have created for that project. These features are designed to make it easier for a developer to check which parts have been finished and which need more work, and the user-defined attributes allow for a degree of flexibility; you might create a custom field to note which developer should tackle which problems, or leave notes behind for someone taking over work on your code.

The tree view is not the only way that VB Analyst can display its information: also



available is a worksheet view (see Figure 2), which lists all the same information in a properly annotated format. You can amend the layout to suit your project, each of the columns can be configured to display any of the attributes of the element, or indeed the results of a variety of operations (or 'tools') built into the system. One example might be to keep a log of feature requests alongside the object to which they apply. As a final touch, you can print out the tree or worksheet views for off-screen study – bearing in mind that a large project will have difficulty fitting on an A4 sheet – or export the worksheet in a variety of formats including RTF, TAB or comma delimited spreadsheet, and

HTML. You can allow VE-D to comment your source code, where each subroutine is prefixed with its attribute information which you can then see from within the Visual Basic environment.

VE-D allows you to filter the information displayed in the chart, according to general or special rules. The General Filter accepts standard boolean operators, while the Specialist Expert filter provides a number of special pre-programmed options, such as showing only objects which are behind schedule, or only those with open bugs. This feature I found useful when trying to work out which parts of a large project needed attention because I had taken the time to use VE-D from the start of it. In the first version I looked at (1.0), the search and replace tool was not working due to a bug. VSE's Web Site (<http://www.softeng.com>) carries a path to version 1.0a for anyone with version 1.0 which fixes this.

Interface difficulties

I had some problems getting to grips with the VE-D interface. VSE has chosen to make extensive use of dialogs rather than controls or menu commands. VE-D does have a toolbar (as shown in Figure 1) for some of the main functions, but far too much of the functionality of the program resides in the inscrutable dialogs which seem to multiply with every function you select. Often, clicking a button in one dialog simply leads you to another. This can be quite confusing, and certainly is laborious.

It took me a few hours to realise that the dialogs in VE-D are almost all *modeless*, and do not need to be dismissed after use. The software makes sure that all dialogs are updated whenever you select a new element, so it's perfectly possible to leave the dialogs open and on-screen for instant access while you work. The only downside of this is that they take up far too much screen real-estate and leave you wishing for a 1640x1280 display!

Hopefully in the next release VSE will take a leaf out of Corel Draw's book and make the dialogs small and compact roll-ups.

Bug hunting

The second part of VE-D is Bug Tracker. Bug Tracker modules are generated along the same lines as VB Analyst modules, with the opportunity to define custom attributes at creation time. Once set up, the module opens with a blank worksheet and a dialog allowing you to create different kinds of bug record (including genuine bug, customer bug report, suggestions, etc) which then appear on the worksheet.

Bug Tracker can make use of the filter tools, although the Specialist Expert facility has a different selection of tools in this mode,

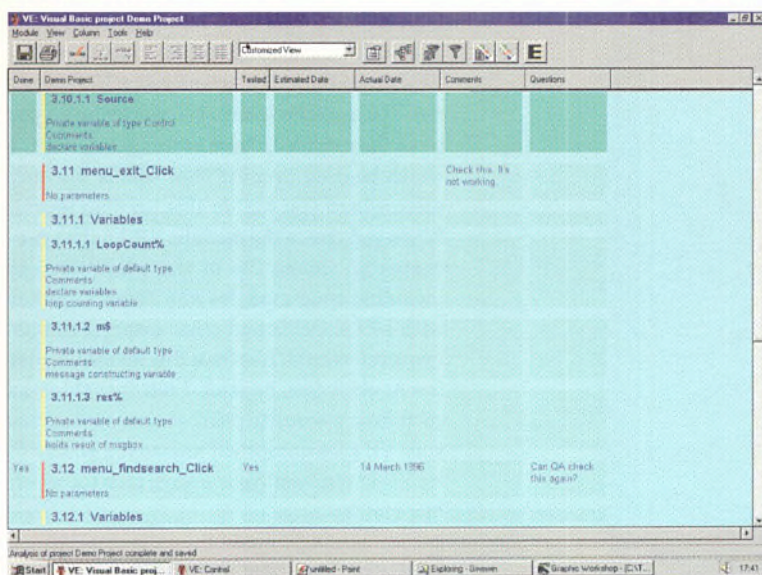


Figure 2 - The Worksheet view shows information in an annotated format



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with options to display only serious bugs, or recent reports, or just those which have been fixed, etc. You are not limited to the worksheet view, either, as Bug Tracker databases can be displayed in the hierarchical tree format.

Bug Tracker will appeal to development teams much more than to individual developers (who need to track bugs but don't need the extra project management features). You could do everything that Bug Tracker does using a conventional database, but where VE-D scores points over that approach is that you can link bugs directly to the code where they arise. In fact, in VE-D you can link just about anything to anything! Which brings us neatly onto the final part of the system...

Trace elements

The final feature of VE-D is the Traceability Expert. This underpins the internal functionality of the program and provides four kinds of link:

- bugs to code,
- code to code,
- bug to bug and
- internal links

Much of this linkage goes on automatically; VE-D uses the traceability code internally to build up the project image, storing the data in a custom object repository. Even the smartest code could not perform all the links you might want, however, and it's possible to generate your own. You can link a particular bug or bugs in Bug Tracker to an element in VB Analyst (or to multiple elements) to show up using the tree view, for example, where a series of bugs is in fact cascading from one part of the program. You can link code to code, so that if you linked together all elements of a project which were related to (but not directly dependent on) each other, you would be able to see instantly at some future time that making a change in subroutine *x* would imply changes to subroutines *y* and *z*. Linking bugs to bugs has less obvious benefits, but could be used to track bugs across different releases of a product. You can inspect the links with the Traceability Analyst, specifying the types of link you wish to see and then bringing up the full details for each. Within VB Analyst and Bug Tracker you can then exploit the links you have made to add further functionality to the filtering and reporting options of the program.

Putting it all together

Taken separately, each part of the Visual Expert Developer system is quite useful. Put all three main parts of VE-D together, and you have the features you need to manage large VB projects. It will take a fair amount of work to customise the system to your own

A Visual Expert glossary

- **Module:** a module is to VE-D what a project file is to Visual Basic, ie the top-level data type. It can be for either the Visual Basic Analyst, or the Bug Tracker. The module contains an image file based on the VB project, plus references into the Visual Expert object repository which holds the data you have input through the program.
- **Attribute:** an attribute is any kind of information which VE-D stores for a particular component in a project. Attributes can be of various types: text, real, integer, boolean etc, and VE-D defines many different attributes as standard (tested/not tested, completion date, comments, questions, developer). In addition, the user can define attributes, which may be of any type, at module creation time. The user-defined attributes will exist alongside the system attributes and have equivalent functionality. This is the key to VE-D's customisability. Through use of attributes you can apply VE-D techniques to different types of project.
- **Object:** in VE-D, an object is any main part of the VB project such as forms, .BAS files, OCXs/VBXs, and DLLs. Objects can have attributes assigned to them.
- **Element:** an element is any part of an object, such as subroutines, methods, properties, classes and controls. Elements, like objects, keep a set of attributes.
- **Link:** in VE-D, links can be made between elements, objects, code, and bugs in Bug Tracker. Links form the basis of the traceability features, which allow you to document various aspects of the structure of your project, and see how changes in one place will affect another.



requirements, but that time will be more than regained in shorter development periods and greater programmer productivity.

The watchword of the program appears to be flexibility, with virtually no limits on the amount of customisation you can do. It should appeal to a very wide target audience of developers, from the individual codesmith to the corporate development team. I had problems with the interface, in particular the endless stream of dialogs, often with too many buttons and controls for my liking, but once I got used to the style I eventually felt

quite at home. I encountered a couple of minor bugs in version 1.0 (which have been fixed in version 1.0a), but on the whole the software is very stable and complete for a first version. There were performance problems: it took a long time to start from launching, and was quite slow in action. (The readme file states that greater optimisation will come later and recommends a minimum of 16 MB RAM.)

I did feel that there should have been more integration with Visual Basic; for example, the ability to jump straight from a VB Analyst element to the source code in VB would have been welcome, as would an interface more in line with VB's own. In particular, VB-style property sheets would have been useful to avoid the 'dialog clutter' and the need to maintain two separate ways of working for each package.

When considering this package, bear in mind that VE-D is not a 'plug and play' tool: while the program can put together information about dependencies, calling/usage relationships and cross-referencing on its own, you will get best use out of VB Analyst if you're prepared to spend time adding that information which Analyst cannot generate automatically, most of it relating to the project management rather than the software. ■

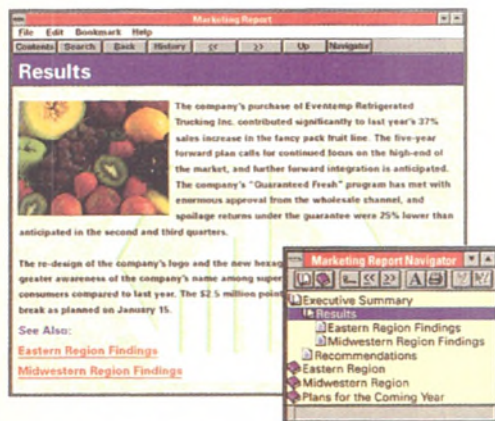
Visual Expert Developer Edition is available from Visual Software Engineering (0990 561246), at £250. VSE is also working on other products in the Visual Expert line, including one for Delphi.

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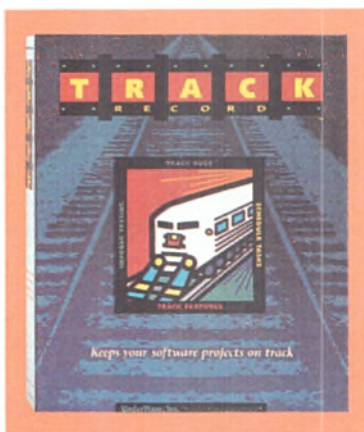


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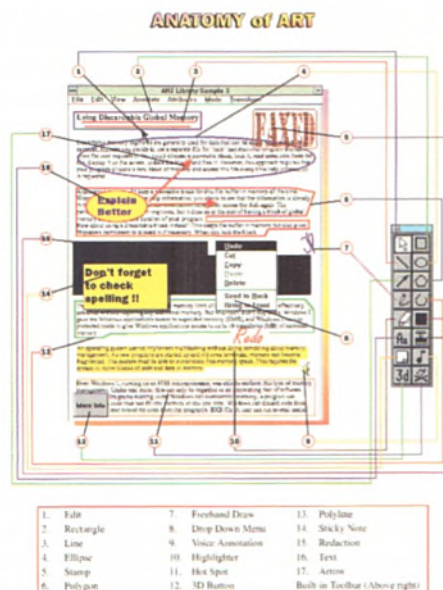


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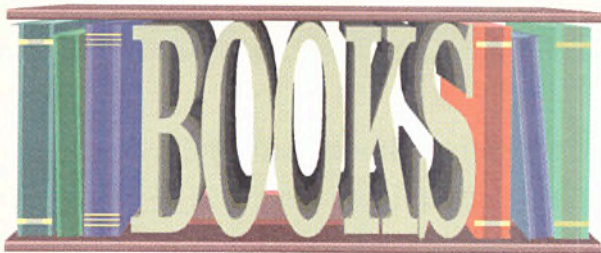
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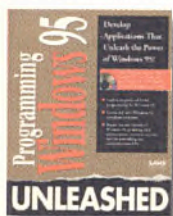
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Programming Windows 95 Unleashed reviewed by Neil Hewitt



Unlike most programming manuals, *Programming Windows 95 Unleashed* consists of a number of sections, each on a specific topic of Windows 95, and each by a single

author, in a sense it is perhaps better considered as an anthology or collection of essays. This is a *big* book – 1078 pages – and at nearly £47, scarcely cheap. Fear not, though, because the value for money factor is certainly high. The book covers features which are either new or significantly changed in Windows 95, so be warned: this is not a book for the Windows beginner. It assumes a fairly high level of existing knowledge and a familiarity with Windows programming in general; it would certainly not be sufficient on its own to provide a complete Windows 95 programming reference.

The topics include *What's new in the Windows 95 architecture*, which takes in the new features of memory management, 16/32-bit thinking, the scheduler, plug and play, long file names, and the registry, *The Windows 95 User Interface* which covers everything from

building smart installers to adding shell extensions (including details of the in-process OLE servers which Windows 95 uses to implement the Explorer shell) a whole section devoted to OLE2, multimedia programming (which mainly covers DIBs), the new Windows 95 common controls, and Windows 95 communications, including a good hard look at Winsock – although not version 2.0.

The text is accompanied throughout by well-commented example code which for once actually makes things clearer rather than more complicated! Some of the code is in C, some in C++, depending on the subject being covered, all of it specified to compile with Visual C++ 2.0 and above (with the Windows 95 SDK). The chapter on OLE2 is one of the clearest introductions to the subject I've ever seen, and goes right from basic OLE through to the OCX. The first chapter on the Windows 95 new architecture is an excellent guide to the topic, giving a clear insight into the world of 16/32-bit thunks and VxDs of which the new system is made up.

There were parts I found disappointing, in particular the multimedia chapter, which I had hoped would contain information on DCI and WinG. (To be fair, this was not complete when the book was written.) There is, however, cov-

erage of more obscure topics such as Remote Procedure Calls which are still not fully understood by many Windows programmers. The book itself is written in a formal but clear style, which I prefer to the sloppy informality of many American manuals, and each writer clearly knows his or her individual field well.

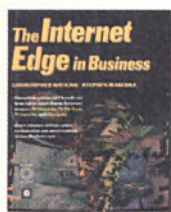
Accompanying the book is a CD-ROM containing all the sample code as well as a host of useful tools and applications, shareware, and commercial demos. I found the supplied browser for this disk to be a little idiosyncratic and difficult to use quickly, but this would certainly not put me off the book itself. As a supplementary manual to aid the Windows 95 programmer in place of several separate and expensive books on each subject, *Programming Windows 95 Unleashed* does its job very well.



Verdict: Recommended for Windows 95 developers

Title:	<i>Programming Windows 95 Unleashed</i>
Author:	Peter Belew et al
Publisher:	SAMS Publishing
ISBN:	0-672-30602-6
Price:	£46.95
Pages:	1078

The Internet Edge in Business reviewed by Mary Hope



I must admit that this is not a book for EXE readers. Its target audience is business users who are high on entrepreneurial drive and low on technology literacy.

The title gives the flavour; or putting it another way, if you are happy using dreadful expressions such as 'leveraging your business advantage' you might like this book.

While it claims to be a 'complete guide and hands on tutorial' with 'case studies of how other companies are successfully using the Internet' it is more of a taster than a main course. The case studies amount to a paragraph on each of about a dozen companies and lack technical and cost details. The uses described are less than startling, eg providing a Web page rather than a brochure as it's cheaper; using the Web to see what your competitors are up to; using ftp to distribute software patches etc. I

found the guide less than complete. Leaving email on one side, there is a distinction between accessing information and putting information onto the net. The former is straightforward and most of the time will be done with a browser. However from a business point of view putting information up is a much more powerful use. In a chapter promisingly titled 'A Recipe for Putting Your Company on the Internet' there was a passing reference to information providers and plug for their 'provider of choice' but no guidance about what a provider might do, at what cost, or how to find one. The alternative approach of companies running their own server is not mentioned. What is mentioned is that the authors' company provides seminars and tools! Could it be that the purpose of this book is merely to provide you with some questions so that you look out for seminars?

There is a CD-ROM provided. Maybe all the answers are on it? No, this is not a 'put in and run' disc. It contains a number of utilities, including an HTML file that will enable you to use the CD-ROM in WWW style, but only if you

have a browser, which is not provided!

There is some good news. Allowing for the American habit of overdoing the metaphors, it is an easy read. The authors are evidently enthusiastic about their subject but throw in notes of caution and realism along the way. For example, commenting on how the Internet facilitates home working one of the authors claims he is more productive when in the office!

Finally, even if it does not have depth it has some breadth and acknowledges that the Internet is more than the WWW with sections on FTP, gopher, telnet, IRC, WAIS etc.



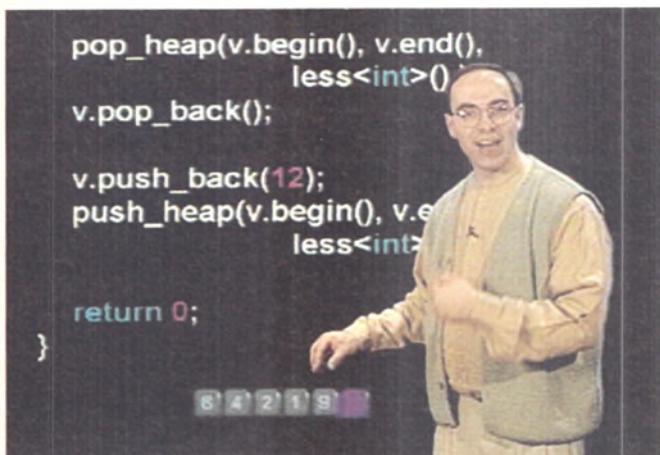
Verdict: Not recommended for EXE readers

Title:	<i>The Internet Edge in Business</i>
Author:	Christopher Watkins & Stephen Marenka
Publisher:	AP Professional
ISBN:	0-12-737840-5
Price:	£19.95
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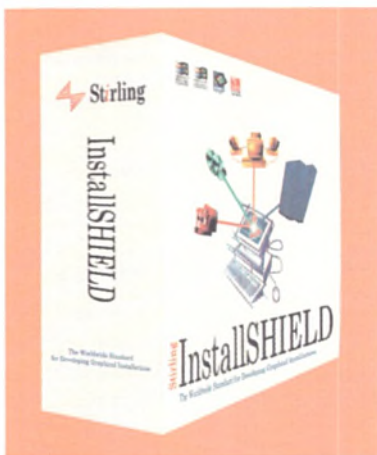
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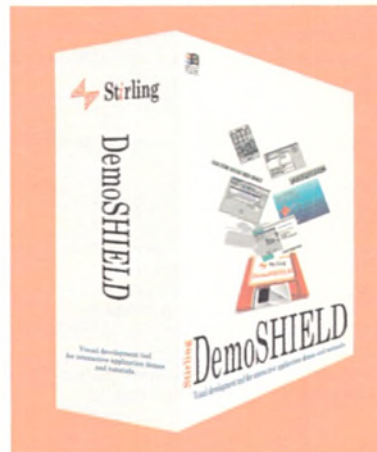
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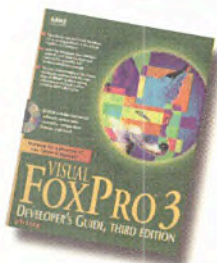
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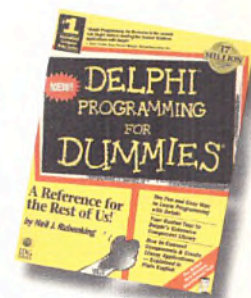
by Neil Rubenking

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Information supplied by the publishers

Selection	RRP	Your Price
Foundations of Visual C++ Progr for Windows 95	£38.99	£29.25
Visual FoxPro Developer's Guide	£41.67	£31.25
Delphi Programming for Dummies	£18.99	£14.25

Descriptions of all books below can be found in EXE Magazine, April 95 to March 96

Selection	RRP	Your Price	Month
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User: anonymous

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Account:

Port: 21

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Form1

Object: Command1 Proc: Click

```
Private Sub Command1_Click()
    ' Connect to the FTP Server
    FTPClient.Action = ACTION_CONNECT
    ' Transfer Remote File to your machine
    FTPClient.FileAction = FILE_ACTION_GET
End Sub
```

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Interfaces*	Environments
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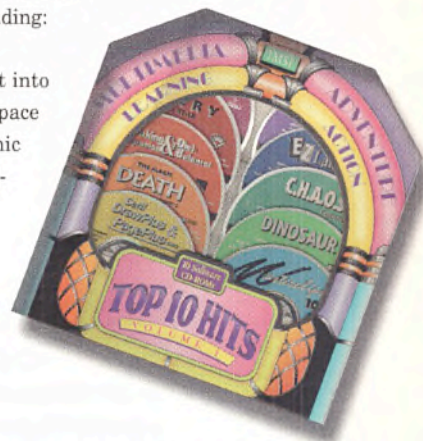


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Competition Winners - February Issue

Smalltalk - Tony Obayori, Croydon

Bill - Patrick Hughes, London

Crossword - Anne Green, Milton Keynes

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JOB	JOB	JOB
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LOCATION	LOCATION	LOCATION
Berkshire	City	Surrey
SALARY	SALARY	SALARY
To £27k	To £28k	To £35k
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JOB	JOB	JOB
REAL-TIME 'C'	UNIX/C/C++	DATABASE SPECIALIST
LOCATION	LOCATION	LOCATION
M3 Corridor	Berks	London
SALARY	SALARY	SALARY
To £30k	To £25k	To £34k
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BBC encourages sex talk on the net

If you were one of those who had to turn over quickly at the sight of the BBC's *The Trouble With Men*. Fear not. Realising that many of the 'stronger sex' would come over all funny at the mention of adverse health, the sensitive Beeb has launched an email personal advisory service.

'Men, particularly young men' explained Steve Brown, 'are the least likely to seek help from a telephone helpline'.

The service also provides online info on the prostate, testicular cancer, impotence, coronary heart disease, infertility and HRT.

Having seen the speed with which some members of Ctrl Brk's flat will flip to another channel at the prospect of these subjects, we think the project a highly commendable one.

troublewithmen@bss.org



Gripping stuff

Action on the Net appears to be moving up a gear as an increasing number of companies start to broadcast real-time live action from various events.

The Association for Computing (ACM) chose IBM to create a web site for last month's six game match between World Chess Champion Garry Kasparov and the company's Deep Blue, the fastest chess computer so far.

For those of a more frivolous nature, popular beat combo *Supergrass* also made a bid to broadcast a live concert from its web site.

Being the proud owner of Internet access that would probably work slightly faster if it were clockwork Ctrl Brk remains sceptical as to the number of people able to access such a generous free concert. We feel that IBM may be slightly nearer the mark 'The Internet is the perfect medium to cover a chess match' commented IBM's Carol Moore, 'because of the game's pace'.



Brion and Betty

by Neil Kerber



A right Royale selection

Ctrl Brk had hoped that the unspeakably popular Mr Q Tarantino could worm his way no further into the bosom of English consciousness. Until the moment when IDG Books saw fit to introduce characters with the ubiquitous black suit, tie and shades to the formerly tranquil world of software training.

Dubbing their titles the *Reservoir Dummies* (have they no shame?), IDG is proudly trumpeting its titles as the gun-toting hard guys of the Manual industry with the sloganand let's get to work.

Ctrl Brk is still not convinced as the verity of such a campaign as its launch date has been calmly set at April 1st. However, after its previous launch of *Sex For Dummies*, authored by Doctor Ruth there can be few boundaries left for IDG to break in its mission to revolutionise the computer publishing industry.



Does that come with a guarantee?

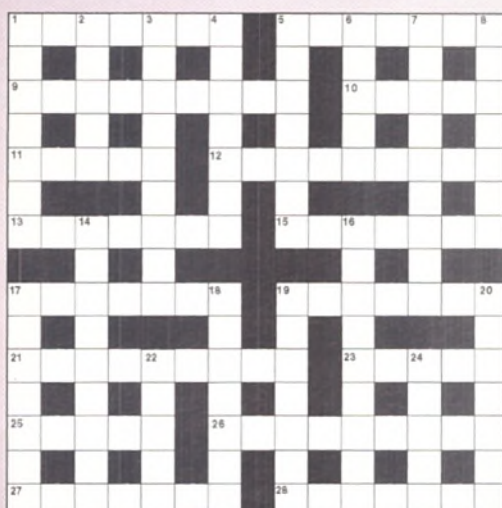
With flagrant disregard for the many jokes that will arise, The Meteorological Office is offering for sale a software program which it claims can accurately forecast thunderstorms. Perish the thought that a humble gossip page such as Ctrl Brk should cast aspersions, but we can only presume that they've been ironing out the bugs of the software that allowed Michael Fish to calmly announce no bad

weather was on its way, on the eve of the great storm... Cynics could always buy the package, and then plan for the opposite of whatever is forecast.

At least they've put in some time on the 'colour graphical display' of forecast lightning risks - if the weather does turn out to be wrong, there'll still be something interesting to look at.



PRIZE CROSSWORD



ACROSS

1. Cheer the keyboard (7)
5. Letting letters share (7)
9. Put the program in again with harness by horsebox (9)
10. Kilomega den of egg-white (5)
11. French student takes undenary base without final direction (5)
12. Giving a name to a variable, say (9)
13. Human or auto bank staff who narrate (7)
15. Fighting machine with broken radiator and drinking mug (7)
17. One who breaks systems into their parts (7)
19. Get out of code of the French basement (5)
21. NOT an accelerator or catalyst (9)
23. Politically correct I ban a mid-East source of slaves once (5)
25. With barriers I make pretty screen prompts (5)
26. Big steps in the history of IT best seen from water (9)
27. Gave up the income? (7)
28. Have doubts about possible criminal (7)

DOWN

1. Charge flow at the moment (7)
2. Rumour disturbance in the channel ... (5)
3. ... in a very dirty way (9)
4. Switches possible action on (7)
5. Mass (part) of many Os and 1s (7)

6. Ruler's small rule with metal (5)
7. Virtual? Don't believe it! (9)
8. Parked, but not the disc (7)
14. Hateful - dislike a few (9)
16. Pet labels (9)
17. Measure output by pH sensor (7)
18. Used @sum(...), for instance (7)
19. Courageous deeds of the Portuguese circles (7)
20. On the way to a van (7)
22. Dependent on major number, discs start (5)
24. Push boat (5)

SOLUTION TO MARCH'S CROSSWORD

ACROSS: 1. FILES 4. AMENDMENT 9. OPENFILES
10. PARSE 11. CASTE 12. SHELTERED
13. ABASERS 15. NOWHERE 18. TYPISTS
20. DEBASED 21. SORTSDATA 23. ONION
25. ALARM 26. POLITESSE 27. ENDEAVOUR
28. DOERS

DOWN: 1. FLOWCHART 2. LEEKS 3. SUFFERERS
4. ATLASES 5. EASTERN 6. DEPOT 7. ERRORLESS
8. TREED 14. AMPERSAND 16. WEBFOOTED
17. ENDANGERS 19. SHAMPOO 20. DIALLER
21. SLAVE 22. SAMBA 24. ISSUE

I prefer tea

Ms Stob has decided that it is time to deliver one of her world famous 'leading edge of technology' briefings.

Hi Ver! What's it all about this month?

Don't call me 'Ver'. I thought it was time I gave you my thoughts on 'Java', the new and little-discussed Internet tool from Sun Microsystems.

Coo, so we can look forward to 500 words of adoration with terrible coffee-oriented single entendres every other paragraph?

Yup, as required by the Sun licence agreement for writing about Java. What's the problem - coffee puns **not your cup of Ness-caff**? I could try to **filter** them out, they can get to be a bit of a **grind** if you aren't feeling **full of beans** (and I should **cocoa**).

Mercy! Do some of the adoration bit.

All right. The Java programming language is completely platform-independent, thanks to a p-code system...

P-code system? Are you sure that you haven't got this muddled up with that old Pascal press release we used to wedge the CD-ROM drive in place?

No. Unlike *that* p-code system, which was the very much third place competitor behind MS-DOS and CP/M 86 to be the standard PC operating system but failed owing to glacial speed, *this* p-code system runs like...

... like a spilt café-au-lait across a rich aunt's best tablecloth?

I'll do the coffee references, thank you. Anyway, it runs jolly fast; probably as fast as a Visual Basic 4 16-bit application.

I find that easy to believe.

Yeah, yeah, sneer away. Even language snobs like you will like Java. Although some say it's a blend of Eiffel and...

A gold blend surely?

I won't tell you again. A blend of Eiffel and C++, it's really mostly based on the latter, only with all the nasty bits, that cause Honest Programmers to Make Mistakes, taken out.

You interest me despite myself. So Java is some kind of C++-a-like, where the basic `cout << "Hello World\n"` still works, and one still has dear old pointers to give you a bit of speed, but they have done something about the assignment = and equality == operators?

Errrm, well...

What? Which one of those things doesn't it do?

It doesn't do any of them. Operator overloading has been dropped because it's obscure and never

used; pointers have been dropped because they are not suitable for a secure system like Java, and the standard C/C++ symbols for assignment and equality have been retained for the sake of maximum leverage of existing code skills.

Terrific. What sort of applications do you actually write with Java?

Less of the 'application', thank you, we call them 'applets' - it's a much more 90s word, more caring. There is a whole range of exciting things you can do, from noughts and crosses, to an amusing animated 'Page under construction' creature with a pneumatic drill, to a flying toaster, to a Mickey Mouse whose eyes follow the mouse cursor, to a...

I get the idea. Truly an awe-making gamut. Anything else you want to say before I go?

Yes. Don't forget to pick up a copy of my new bestseller from Manuals for Pirated Software Publishers Inc. It's called 'Learn Yourself Java - 59 minutes', and is not to be confused with the many hundreds of similar titles appearing this week.

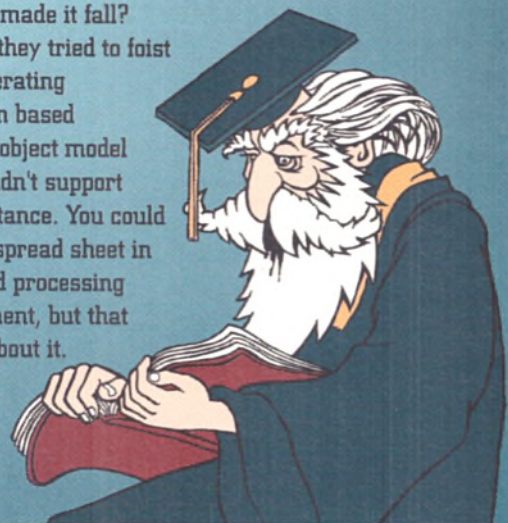
Presumably this book is freely adapted from your old bestseller 'Learn Yourself C++', and a help file you found knocking around the Java site. And what, pray, is the significance of the '59 minutes'?

You need to ask?

INHERITANCE is the key that gives the programmer the power to build software applications in terms of components accumulated by his



What made it fall?
Well, they tried to foist an operating system based on an object model that didn't support inheritance. You could put a spread sheet in a word processing document, but that was about it.



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Source: BSA

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Ease of Use	8.3	7.2	6.8	6.3
Versatility/Features	10	8.7	8.8	8.6
Compatibility/Power Consumption	6.7	6.5	6.6	7.4
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