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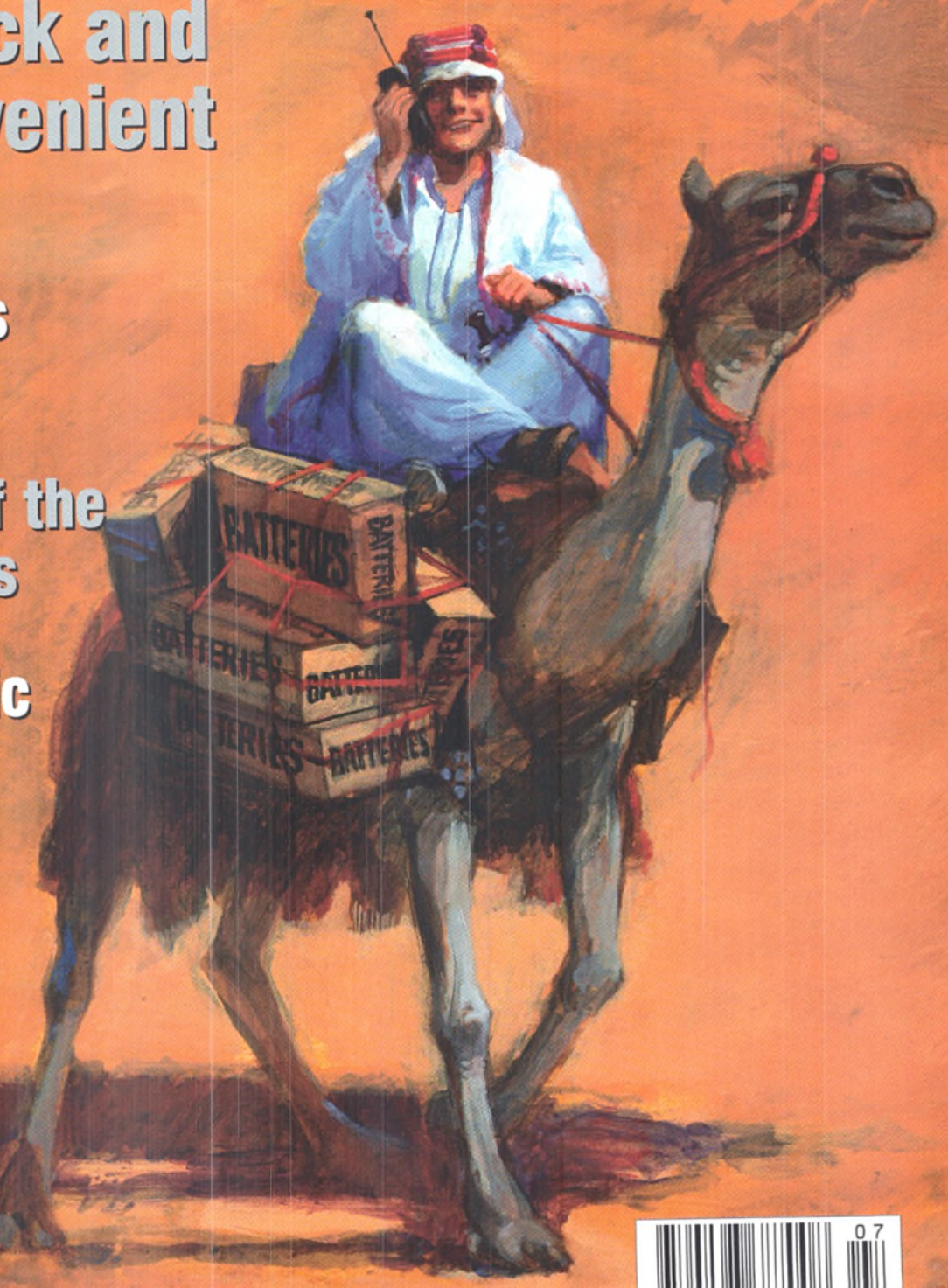

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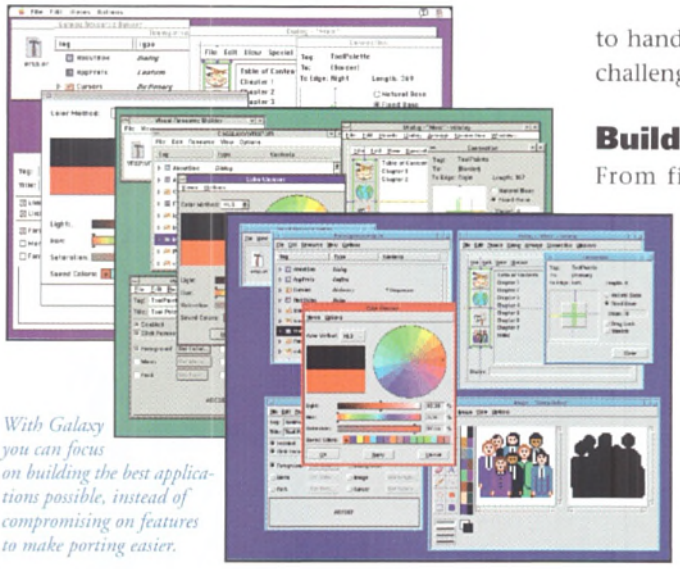

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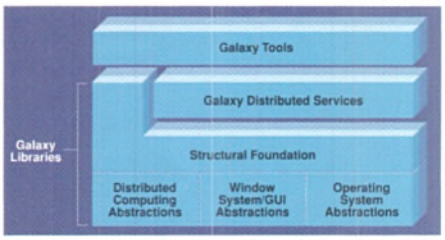

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Great Value Book Offers see page 69

COMMENT

Soap Flakes 3
How dynamic data visualisation brings complexity under control. Plus: is Warp a viable development target?

Mayhem 4
Introducing, for your entertainment and delight, Kinetico the Stupendous - erm, ShuffleBot the barely plausible - erm, well, judge for yourself. Jules May has been inventing weird things again.

NEWS

News Review 6
Report from the EXE Show. Smalltalk on the move. BT's vision of the future.

Products News 8
The heat behind HotJava. DLLs in VB. API extensions for OS/2 Warp. A new version of Codewright, the programmers' editor.

Letters 13
LZW patenteese, the joystick fire buttons and how language bugs are treated.

REVIEWS

In leaps and bounds 49
When developing in Windows, it helps to have a debugger that pulls its weight. Colin Smith takes the Bounds Checker penguin on a bug hunt.

Creating Windows DLLs using only Basic 59
Have you ever wanted to create a Windows DLL from within the Basic language? Robert Stimpson found two approaches without having to resort to C.

Books 64
Efficient C/C++ Programming, an indispensable cookbook for the art of real-world efficient C/C++ programs, reviewed by Bob Swart.

FEATURES

Wireless & wired 15
Wireless mobile phones and laptop computers now can be connected. David Mery shows how to take advantage of the combination of the two.

Extended stored procedures for SQL Server 23
Microsoft SQL Server now lets you go a long way beyond standard SQL syntax. Mike Campbell explains how it is even possible to reach the Win32 API.

TECHNIQUES

HyperText Markup Language 3.0 29
The evolution of HTML has been led by Web site developers. HTML 3.0 is the proposed new version that incorporates many of the features that they have requested. Paul Richardson tries them out.

All about processes... well nearly 37

The only certainties are birth, death and being a zombie... Peter Collinson takes us through the highlights of the life of the humble process, showing how it has changed as UNIX itself has evolved.

It's time to write of many things 45
Francis Glassborow brings a new eclectic approach to his column, including a spot-the-mistake quiz and an introduction to smart pointers.

THE BACK END

Sub Club 69
Competitions, freebies and offers for EXE readers.

Ctrl-Break 71

Verity Stob presents the Underground Diary of a Billionaire's Missus. The crossword and our Worst World Wide Web sites selection.

Recruitment 65

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News & Views

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This is not a new tool, but is from the same company as C-Vision and will appeal to a similar audience.

"C++ is one of the most grotesque and cryptic programming languages ever created"
Ray Duncan

It is also one of the most complex. If you think you are a C++ expert, then you probably aren't! Yet it is one of the most widely used languages, and the only realistic choice for many applications. You need all the help you can get.

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CIRCLE NO. 191

SoapFlakes

Mimicking reality

I ONCE HEARD a lovely story about a carefully constructed computer program designed to calculate the timing for automatic release of a bomb from a fighter aircraft. The computer was accurately programmed to assess the plane's speed and altitude and the distance to the target. Unfortunately, the program listing and the alpha numeric table of results failed to alert the system designer to a potentially fatal oversight. The way the program was written, the aircraft would release its lethal cargo even if, at the moment it passed over the point when the bomb should be released, the pilot was flying upside down.

One picture would have immediately alerted of the danger. Had the application been developed, tested and implemented using an animated, graphical representation of the aircraft in flight, the problem would have been transparently obvious.

The ability of the brain to recognise visual patterns and detect even subtle changes is quite astonishing. In spite of this fact, many critical computer applications still present users with textual output or complex tables of figures which are extremely difficult to read or understand. The problem is exacerbated by the fact that the critical time when we really need clear, concise information is at moments when we are under greatest stress - when a patient goes into trauma, when customers complain that the communications network is down, when a power reactor shuts down or when a component fails in a vital production process. On such occasions, we are least prepared to wade calmly through tables of figures and rationally interpret figures and text to find out what has gone wrong.

Even where graphic or pictorial diagrams are available, they are usually confined to simple line graphs, bar charts or textual displays depicting static data collected at one historical moment in time. In real-life situations - whether controlling a process plant or monitoring vehicle movements in air, space or on the ground - a continuous data feed from sensors, equipment and other component devices is generally available to advise of all changes in status, performance and loading. To be fully effective in monitoring and managing critical processes, graphic systems need to be capable of interacting with these data sources to reflect the dynamic nature of the environments in real time.

One technique which achieves this is the use of the synoptic display or mimic diagram - animated simulations that project the behaviour of graphic objects within a visual representation of their environment. Synoptic diagrams provide a powerful and intuitive method of displaying and interpreting complex data and they are growing in popularity as the price/performance ratio of hardware capable of handling the graphics processing has come down.

We need to make the computer work harder to present information in a visual form that human engineers and managers can more easily understand and interpret. We need to stop trying to force the human mind to work like a computer, juggling huge tables of digital information.

John Massey, Managing Director of Tenet Systems Limited

The Warp factor

IT'S RATHER POINTLESS comparing Windows with OS/2 Warp. Pointless because Windows 3.x has an installed base of 70 million users and OS/2, well, doesn't.

But there is a flip side to this from a developer's point of view. The Windows market is pretty much wrapped up. There is no point launching another word processor, spreadsheet or any mainstream application, because however good it is, you aren't going to get anywhere without, for starters, a Microsoft-sized marketing budget is behind you.

Warp, on the other hand, is different. The user base may not be Windows-gargantuan but, according to IBM, Warp *is* selling: half a million copies in the first 60 days. According to John Thompson, IBM's general manager for marketing and solution developer programmes, the market for native Warp applications is worth around $9 billion and growing. There should be enough to satisfy the appetites of a generation of disillusioned Windows 3.x programmers.

IBM desperately needs more Warp developers, and is working hard to court the developer community. To allow Win32 developers to be able to port their applications to OS/2 with minimal effort, it has created an extended Warp API which permits 80% common application code between the two platforms. Naturally, one remains suspicious about the 20% remaining, but the Developer API Extensions should act as an added incentive to coax Windows developers to move their applications to Warp.

Who are these users who are gasping for Warp apps? There seem to be two very different types. There is the corporate buyer - IBM's natural constituency - who wants solid, no-frills, proven technology that's scaleable throughout the enterprise and is going to be around in five year's time. On the other hand, Warp is being pushed into the home as a zany, trend-setting, multimedia platform for people who want to try something that's **not** Windows.

By targeting the home user, IBM risks alienating its dedicated corporate stronghold. But to the developer, Warp in the home is certainly good news. So long as IBM continues to plug Warp to the consumer, there will be a demand for new OS/2 applications.

Admittedly other aspects of IBM's behaviour are not so encouraging for prospective Warp developers. For example, the Lotus acquisition may well damage the market perception of Warp. Lotus Notes is already the biggest selling OS/2 application, and now the biggest selling OS/2 application belongs to IBM. Sure, IBM will reap the immediate financial rewards, but now there is one fewer independent software company developing for Warp. It's all very well targeting an uncrowded market; but the thing can be overdone.

Of course, Warp's biggest test is yet to come. On August 24th (the latest date from Microsoft at time of writing) Windows 95 will be finally released. The first mainstream 32-bit operating system from Microsoft will obviously be a force to be reckoned with. And yet, and yet... Warp has the advantage of already having obtained stability, whereas we are still hearing of the compatibility problems caused by Windows 95. If too many existing applications fail under Windows 95, if it won't run on all those home PCs, if Microsoft fails to make the standard stick...

The race is not over yet.

Cliff Saran

Mayhem!

Ladies and gentlemen! Introducing, for your entertainment and delight, Kinetico the Stupendous - erm, ShuffleBot the barely plausible - erm, well, judge for yourself. **Jules** has been inventing weird things again.

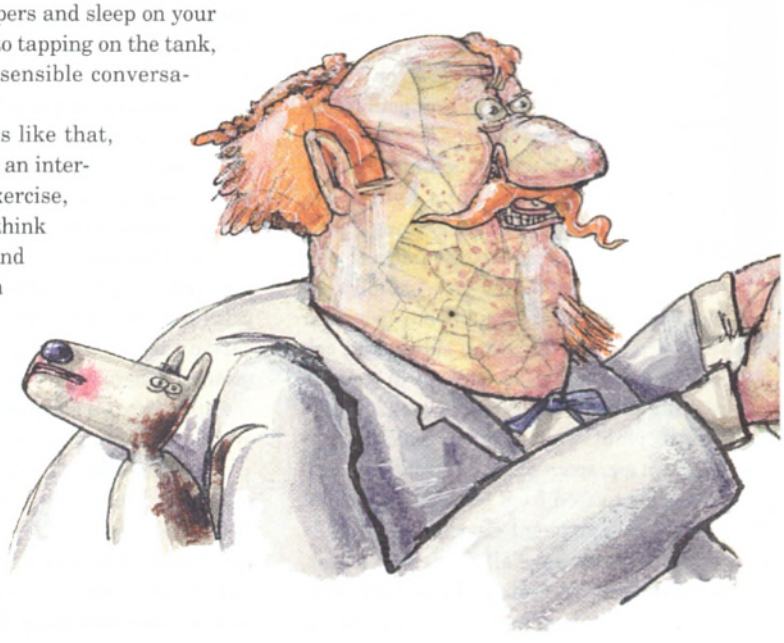
Back in October, you may remember, I was musing about making an artificial intelligent system which could control a motorbike, and lamenting about the fact that it was so difficult. Some would say that it's because I don't have enough real work to do, but I haven't stopped thinking about that problem, and gradually, almost imperceptibly slowly, parts of the puzzle started falling into place.

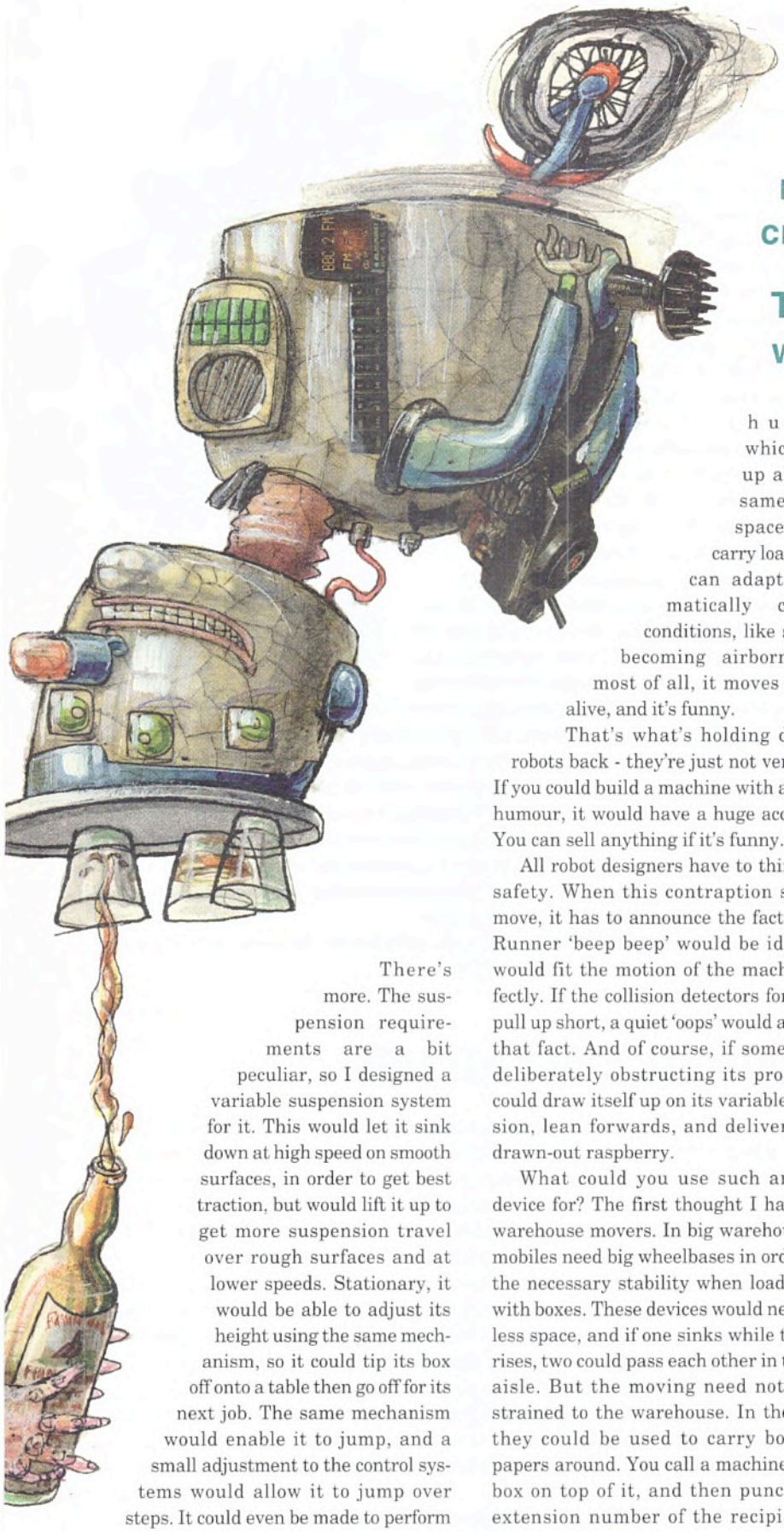
Something else was interesting me at the time. Mobile robots are well-established in the public consciousness - science fiction has been telling us about them for years - but apart from a few totally impractical toys, they have never really taken off as a practical proposition. There's a reason for that - most mobile robots are pretty useless. After all, they take up loads of floor space, are as manoeuvrable as a car, they need special machinery to load and unload them, they are heavy, noisy, and need constant recharging. Probably the most practical use is motorised wheelchairs, which although may be a boon to their owners, aren't exactly the pinnacle of robot design. Most of all, though, robots are so mechanical. They don't purr, they don't tear up newspapers and sleep on your feet, they don't react to tapping on the tank, and they don't hold sensible conversations.

My robot bike was like that, too. It may have been an interesting intellectual exercise, but I really couldn't think of a single use for it. And then, inspiration struck. My problem, you see, was that I was trying to control the forces on two wheels, where each wheel was doing a similar, but different job. If I was having such problems partitioning the tasks between the wheels, why not take one of the wheels away?

You know something - it works. It is not only possible to make a unicycling robot, it's easier than controlling two wheels. As the dynamics came into focus, and I understood how the thing would move, I laughed myself silly. In order to travel forwards, it would have to lean forwards, so from a standing start it would have to drive the wheel back a little, wait for the body to fall forwards, and then drive the wheel forwards. Stopping would have the same little jiggle - to slow down, it would drive the wheel faster for a moment. To turn left, it would step the wheel out to the right. It would move, in short, exactly like a cartoon character.

That's not all. The exact same sums would enable it to balance things on top of itself. It could be standing there, shuffling and whirring, and if you dumped a heavy box on top it would automatically shuffle in order to prevent the box from toppling. It could even balance glasses and bowls containing liquids. Now, moving forward would involve controlling the attitude of the payload as well as its own attitude.





I've explained my unicycle robot idea to quite a few people, and nine out of ten think I'm crackers.

That proves I'm onto a winner.

There's more. The suspension requirements are a bit peculiar, so I designed a variable suspension system for it. This would let it sink down at high speed on smooth surfaces, in order to get best traction, but would lift it up to get more suspension travel over rough surfaces and at lower speeds. Stationary, it would be able to adjust its height using the same mechanism, so it could tip its box off onto a table then go off for its next job. The same mechanism would enable it to jump, and a small adjustment to the control systems would allow it to jump over steps. It could even be made to perform pirouettes and somersaults.

Now, I'll freely admit that a unicycling robot is a totally barking idea, but let's look at what we've got. We have a machine which is only slightly less manoeuvrable than a human, which takes up about the same floor space. It can carry loads, and it can adapt to dramatically changing conditions, like suddenly becoming airborne. But, most of all, it moves as if it's alive, and it's funny.

That's what's holding domestic robots back - they're just not very funny. If you could build a machine with a sense of humour, it would have a huge acceptance. You can sell anything if it's funny.

All robot designers have to think about safety. When this contraption starts to move, it has to announce the fact. A Road Runner 'beep beep' would be ideal, and would fit the motion of the machine perfectly. If the collision detectors forced it to pull up short, a quiet 'oops' would announce that fact. And of course, if someone was deliberately obstructing its progress, it could draw itself up on its variable suspension, lean forwards, and deliver a long, drawn-out raspberry.

What could you use such an idiotic device for? The first thought I had was of warehouse movers. In big warehouses, the mobiles need big wheelbases in order to get the necessary stability when loaded down with boxes. These devices would need much less space, and if one sinks while the other rises, two could pass each other in the same aisle. But the moving need not be constrained to the warehouse. In the offices, they could be used to carry boxes and papers around. You call a machine, place a box on top of it, and then punch in the extension number of the recipient. For offices, and as a personal porter, it would be much more effective than a four-wheeled vehicle.

As a personal porter, it would have immense value as well. At parties, where one is standing up, and has run out of hands holding a glass, a plate of food, a mobile telephone, a pen and trying to find a business card, the robot could have a tray on top, holding all of these essentials. Normally it would sit behind and to one side of its owner, but when he reaches out his hand, it would step forward, offer up the tray, and then when he's picked up or put down whatever it is he wanted, it would settle back into it's appropriately deferential position.

But probably the best use would be the one I identified in the opening lines - as a replacement wheelchair. People in wheelchairs spend their lives sitting down. That gives them, at these parties, an unequalled view of the other guests' waistbands, and a stiff neck with having to look up all the time. What's more, the wheelchairs take up more floor space than walking guests, and since the wheelchair users face is well below eye-level, they disappear from the crowd, being replaced by a big hole.

This device would solve all these problems. It would raise them to normal eye level, and reduce the floor space needed. People who still have upper body control can lean to control their attitude, and thus their direction and speed. People without could use some other control mechanism, and the robot would take responsibility for balancing them on top.

I'm not sure how serious I am about this idea, though I think I'm going to build one, just to prove it works. I've explained it to several people, and although a few see some merit in it, nine out of ten think I'm crackers. That proves I'm onto a winner. ■

Jules moved from four wheels down to two when he bought the motorbike. Now he's moving from two wheels to one. The next step is to remove the final wheel and levitate. Do you think he can do it? Call him on 01707 662698, or email him as jules@cix.

Manzi to stay

Jim Manzi, Lotus Development Corporation's chief executive, is to remain in charge of Lotus after the $3.5 billion takeover by IBM announced recently. Manzi will become a senior vice president of IBM, although Lotus will still operate separately from IBM. The takeover of Lotus was agreed after IBM raised its hostile bid of $60 per common share to an agreed price of $64. IBM hopes to revive the flagging Lotus, but claims the aquisition has nothing to do with OS/2.

BT's crystal ball

A BT study foresees 3-D videophones, machines that recognise body language and gestures, and e-mail that talks to you over a mobile telephone, all within the next 25 years. A key element in making advances like these possible will be a huge increase in computer power, which could be a million times greater than today. Using a variety of strategies, including projection, extrapolation and 'guessology', BT has compiled some 200 predictions of technology and society. To find out more, call Nick Gordon-Brown on 0171 7296088.

Parallel solutions

Parallel processing has the potential to revolutionise operational systems, decision support systems and multimedia applications. This is the core message from the new report just published by Ovum, *Beyond the Data Warehouse: New Markets for Parallel Computing*. Ovum predicts that the market for commercial parallel systems will rise from $1.5 billion in 1995 to $2.5 billion by the year 2000. The growth is attributed to four main factors: accelerating user demands; decreased price of off-the-shelf components; support from leading industry suppliers such as IBM and Oracle; and parallel-platform availability of RDBMSs. The report is available for £995 - you can reach Ovum on 0171 2552670.

The rewards of innovation

With over 60 computing undergraduate entrants from all over the UK, the Softwright Innovation Award has attracted a wide variety of imaginative software projects. Entries have ranged from an OCR program for Hindi, to an expert learning system for nurses. The scheme was conceived by object technology software house Softwright. The results will be announced on September 20th - the first prize is a hefty £2000 worth of hardware plus a year's free subscription to CompuServe. For details contact The Softwright Innovation Award Office on 01628 524611.

EXE Show

The first *EXE* Software Developers' Show was a fun-packed two days held on 8th and 9th June at the Royal Horticultural Halls in Westminster. Major presences included Borland, Computer Associates, IBM and Symantec, but there were many other stands ranging from tool vendors to bookshops. The *EXE* stand itself proved to be a popular hang-out for developers and exhibitors alike - the attraction may well have been the demonstration of *EXplodE*, *EXE*'s World Wide Web site (http://www.exe.co.uk).

Attendees enjoyed software demonstrations, talks and 'guru hours' with industry figures like Bertrand Meyer, inventor of the Eiffel programming language, who considers the 'selfishness principle' to be a major concept of object orientation: objects are defined by their interface (what they have) instead of what they are. Seminar topics covered Windows 95 (with Matt Pietrek and Todd Johnson), the Internet, object technology and other less contentious issues. An interesting discussion was Keith Gladstone's on behalf of the RNIB, entitled 'Creating applications for the visually impaired.'

As far as software was concerned, there was a great deal to see. A popular theme of the show was multi-platform development, with Zinc's Application Framework 4.0, Professional Software's Utah, IBM's VisualAge C++ and Nat Systems' NS-DK/2 all making an appearance. Software metrics toolkits were also abundant, ranging from Program Analysers' LDRA Testbed to the impressive suite of code analysis tools offered by McCabe & Associates. Other offerings included postcode software, anti-piracy devices and code translation programs.

The date of the next *EXE* Show is still to be decided. If you want to find out more, speak to Tim MacPherson on 0171 2875678.

Smalltalk's not all talk

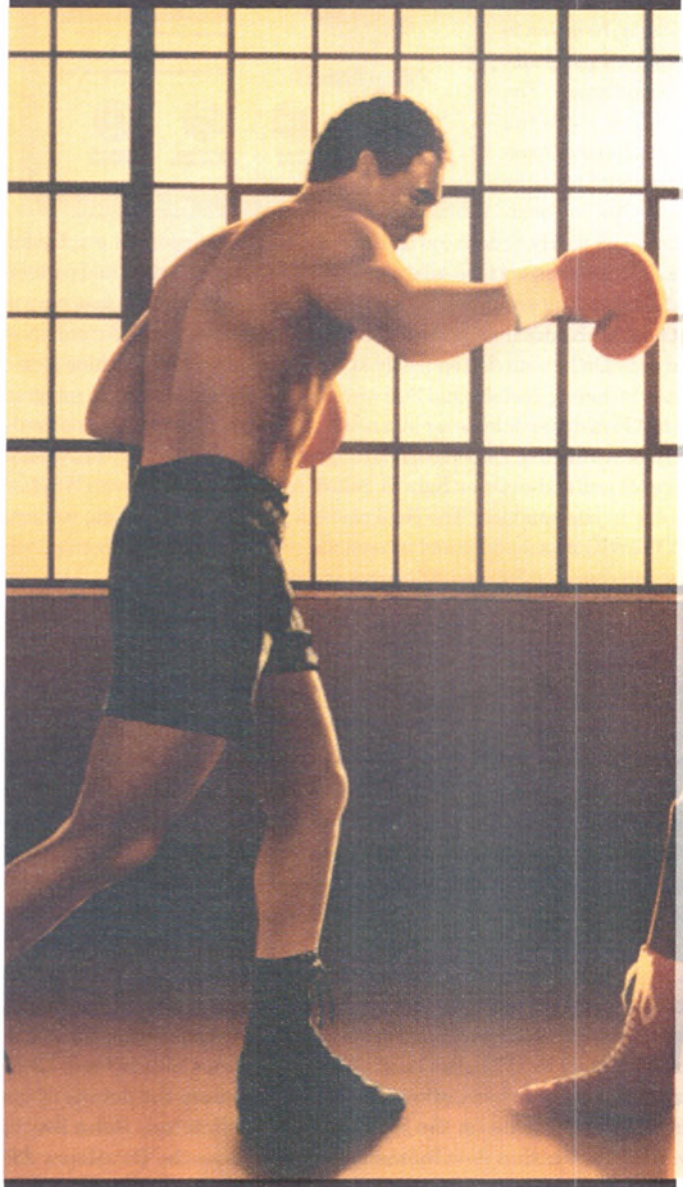
A study by International Data Corporation commissioned by STIC, the Smalltalk Industry Council, of nearly 300 corporate programmers shows Smalltalk on the move. It rated highest among object-oriented languages for corporate application development in terms of its *suitability* for such projects rather than its current prevalence in the industry. 'This survey proves that Smalltalk is gaining momentum as an idea whose time has come', claims Peter Day of Bloomsbury Software, UK distributor of Digitalk Inc's Visual Smalltalk.

The survey was conducted as a series of in-depth interviews rather than a questionnaire, leading to some interesting - and often personal - insights. For example, programmers thought it possible to become a 'recognised expert' in Smalltalk in just 18 months, compared with 23 months for C++. Significantly, 26 percent of object-oriented professionals *not* currently using Smalltalk would recommend it to MIS shops planning to adopt OO methods.

The study showed that four of the predominant problem areas associated with Smalltalk - speed, garbage collection, memory and ease-of-use - are becoming less and less of an issue, as operating systems become more resource-intensive and Smalltalk implementations better designed.

With portability, robustness and extensibility being prime considerations for big IT projects, the efficiency gain afforded by using a language like C++ (which has small run-time overhead) rather than one like Smalltalk or Lisp is becoming less significant. The current fad for RAD means developers are looking for environments suitable for prototyping and which provide rich run-time support. Maybe Smalltalk's time *has* come. International Data Corporation can be reached on 001 508 8728200.

BOOCH VS RUMBAUGH



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CIRCLE NO. 209

Polishing off Visual Basic

Aardvark Software has released the Polisher, a source-code processor for Visual Basic which performs, among other things, syntax-aware spelling checking, configurable code formatting and automatic generation of comment blocks. You'll be able to get a copy from Grey Matter, on 01364 654100. At the time of writing no UK price was set but it's shipping for $129 in the US.

Real-time OS for PowerPC

Swedish company Enea Data, provider of time-critical systems and development tools, is implementing its OSE Delta real-time operating system for the Motorola PowerPC 603 chip. OSE Delta is a distributed operating system designed for use in non-stop and fault-tolerant systems, such as telecommunications applications, and is the latest addition to the OSE family. Currently it's only available for Motorola 68xxx and AMD 29K microprocessors - a full port to the PowerPC architecture is scheduled for early 1996, although beta releases will be available earlier. You can speak to Enea Data by dialling 0046 86385000.

Codewright for VC++

Premia Corporation's new version of its Codewright programmer's editor has all the features of its standard Professional edition, with the added ability to plug seamlessly into the Microsoft Visual C++ IDE. Codewright Fusion comes with command sets compatible with other popular editors such as Brief, file comparison, language templates, a syntax-sensitive spell checker, brace/parenthesis matching and much more. If you're grabbed by grep or desperate for programmable macros, this could be for you. Programmer's Paradise 0161 728 4017 is selling it for £98.

Eiffel

Interactive Software Engineering's Eiffel development environment is available for Windows. Currently, only an entry-level version is available, for just £79 - this is interpreted, and doesn't come with a compiler, although all libraries provided are precompiled. A full-blown Windows version is on its way, for £650. The package is also available for Linux (£179); full Unix versions start at £1700. The low-end versions don't come with a language reference, so it may well be worth investing in Bertrand Meyer's book *Eiffel: The Language* if you're interested. Speak to Everything Eiffel on 01772 687525 for details.

The heat behind HotJava

You may have already heard about HotJava, Sun Microsystem's new World Wide Web browser - especially if you've been perusing *EXplodE*, *EXE*'s on-line Web site. HotJava builds on the Internet browsing techniques established by Mosaic by implementing the ability to add arbitrary behaviour. Using HotJava, you can embed entire multimedia applications into standard text files which the user can download and execute locally.

Lurking behind the scenes, however, is Java itself, an object-oriented programming environment for the Internet. The Java language gives HotJava users the power to develop small, interpreted applications - 'applets' - to distribute over the Net. Modelled primarily on C++, but omitting many of the rarely used and poorly understood features of C++ such as operator overloading and multiple inheritance, Java emphasises type safety, compile-time error detection and portability. Although interpreted, the run-time requirements are small. The interpreter and class support need about 40K; an additional 175K adds the standard libraries and thread support. For enhanced performance, interpreted code can be compiled on the fly at load-time into native machine code.

A number of companies, including Toshiba and Starwave, have announced plans to integrate the Java technology and HotJava dynamic browser into new applications they will develop for the Internet. Both Java and HotJava are free for non-commercial use by end-users. They're available in alpha release for developers and end-users on SunOS, Solaris and Windows NT, with Windows 95 and MacOS 7.5 ports due in late summer. The HotJava beta release, available late summer, will include a bundled WYSIWIG page builder and integration with third-party authoring tools. Locate Sun at http://www.sun.com; the Java-specific pages are at http://java.sun.com.

API extensions for OS/2 Warp

The current obsession with cross-platform development seems to have caught IBM's interest as it approaches the problem of portability from two opposing directions. It recently announced its IBM Developer API Extensions to OS/2 Warp, a carefully chosen subset of over 700 API functions and 300 messages which are consistent with the Win32 API. A simple recompilation will soon be sufficient to port many Win32 applications to Warp. IBM has obviously been forced to take Microsoft's marketing plans seriously, with Windows 95 set to topple OS/2 from its position as the most popular PC-based 32-bit operating system.

This concession to Microsoft's Win32 API flies somewhat in the face of the recent object-oriented approach, which relies on abstraction to achieve portability. Platform-independent class libraries such as MFC, Borland's ObjectWindows Library and IBM's own Open Class Library, currently in beta, allow developers to ignore the details of system-specific API calls and concentrate on the logic of their application. John Swainson, IBM vice president of application development solutions, sees the Developer API Extensions as OS/2's solution for migrating existing Windows applications, but thinks software companies in the future will invest increasingly in 'object technology in the form of portable and interoperable class libraries and frameworks.' Currently Open Class Library is portable across AIX, OS/400, MVS and Sun Solaris.

To aid vendors wishing to migrate existing Win16 or Win32 applications to OS/2 that were written without the use of a portable class library, IBM is licensing OneUp Corporation's Source Migration Analysis Reporting Toolset (SMART). It's a code-processing software that will automatically convert the majority of C/C++ Windows code to 32-bit OS/2 Warp, as well as highlighting which parts of the application use the API extensions, and making recommendations for sections it can neither port nor recognise as a call to one of the new APIs.

You can find IBM's Home Page at http://www.ibm.com, or telephone their Solution Developers' Helpline on 0345 522622.

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Visual FoxPro version 3.0

Easy enough to be Visual, powerful enough to be Foxpro
Microsoft Visual FoxPro combines a visual development environment with new tools for creating solutions that include the Microsoft Office and BackOffice families. Its flexible targeting puts existing Xbase code to work in Windows, Windows NT and Windows 95. Visual FoxPro increases developers productivity with the addition of Rapid Application Development features such as dragging and dropping visual classes onto forms. Call for pricing and upgrade information.

PowerBuilder Desktop for Windows 4.0

A powerful Windows desktop application development environment with an integrated client/server architecture which includes powerful object-oriented programming tools. With PowerBuilder Desktop you can easily create robust Windows applications that incorporate data from most desktop databases. The Watcom SQL database is included for development and deployment out of the box.
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Codewright Fusion

Codewright Fusion is a drop-in replacement for the Visual C++ editor. It adds the power of a stand-alone programmer's editor to the convenience of the workbench. Codewright Fusion, available for both 16 and 32 bit versions of Visual C++, provides a host of features never before available under Visual C++.

develop to advantage

WatcomSQL Server

Presenting Watcom SQL, the industrial strength database server that makes deployment of PC Client/server applications both simple and inexpensive. Advanced features include triggers, stored procedures, and a self-tuning query optimiser that "learns" as you use it, making it smarter...and faster. With hundreds of thousands of copies already installed on Windows, NetWare, OS/2 and NT, Watcom SQL is the right choice for PC applications.

MKS Internet Anywhere

MKS Internet Anywhere is an easy-to-use software package that demystifies PC access to the Internet, and enables users to quickly set-up Internet access. It comes with a complete set of utilities including electronic mail, Usenet News, a WWW Browser, file transfers, and terminal emulation. With MKS Internet Anywhere all you need is a PC running Windows 3.1, a modem and a PPP or SLIP Internet account.

VToolsD from Vireo Software

A C library and C++ Class library of functions for developing Windows or Windows 95 Device Drivers. The Quick VxD code generator automatically writes the VxD skeleton. custom header files and libraries automate segment management and expose VMM functions to C & C++ programmers. Debug and final release libraries are included. Combine with Nu-Mega's Soft-ICE/W, to get the complete VxD build and test solution.

Soft-ICE Windows

Debugs Windows executables and DLLs with the capability of setting, breakpoints on I/O ports, interrupts and Windows messages as well as source lines and memory addresses. Exploring Windows internals and the ability to debug Virtual Device Drivers (VxDs) makes Soft-ICE the ultimate Windows debugger. The new Windows 95 version is ideal for Windows 95 VxD developers. £295 each

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Soft-ICE for Windows 95

Nu-Mega Technologies' new Windows 95 system-level debugger loads itself and then loads Windows 95 on top of itself, allowing you to debug at source level, VxDs and other device drivers loaded during the boot process. Furthermore, Soft-ICE debugs both sides of a Universal Thunk (32-bit and 16-bit code) and will catch system exceptions such as page faults or invalid opcodes. A plethora of information concerning paging, memory management, threads, mutexes and semaphores is provided. Nu-Mega recommends Soft-ICE for use with the Bounds Checker debugging tool; see the article *In Leaps and Bounds* in this issue. It costs £295 from System Science (0171 833 1022).

Borland Turbo C++ 4.5

Borland continues to support its Turbo range of compilers with a new release of Turbo C++. Version 4.5 for Windows comes with an IDE, a multi-target project manager, a BRIEF-based editor, an object browser, ObjectWindows 2.5 and Object Components Framework, a C++ encapsulation of OLE 2.0. The compiler itself supports templates, exceptions and RTTI. The whole kaboodle is a snip at £69 - for more information check out http://www.borland.com or call 01734 321150.

C-Vision supports C++

C-Vision is a set of tools to help programmers analyse, understand, document and maintain C source code. Version 4.0, just announced by Gimpel Software, extends C-Vision's functionality to cover C++. The package includes a cross-referencer, which produces lists of symbols with usage and type information; a diagrammer, for function-call graphs and class hierarchies; a source code reformatter; and an intelligent lister capable of identifying block entry and exit points. It's available from Grey Matter (01364 654100) for £145.

World Wide Warp

OS/2 Warp Connect, the latest version of IBM's popular operating system, will ship with a TCP/IP application that lets users simultaneously connect to local/wide area networks and to the Internet. The TCP/IP application includes the IBM Web Explorer, an Internet hypertext browser. Warp Connect itself comes with a variety of other comms products and features, including LAN Distance, which supports remote on-line access to LANs via a telephone line, allowing a laptop to become a remote LAN client. For more information on OS/2 Warp Connect, browse http://www.ibm.com, or ring 01329 242728.

Delphi tools on the way

Borland has responded to the almost immediate demand for Delphi tools by releasing the RAD Pack for Delphi, a 'companion' tool set which includes Resource Workshop, Resource Expert, Visual Solutions Pack, a printed version of the Delphi Language Reference Guide, Turbo Debugger and the source code for the Visual Component Library. This last item will be of particular interest to many developers, giving them some insight into the library's internals and allowing the creation of custom components based on standard Delphi ones.

MicroHelp, Crystal and FarPoint Technologies, partners of UK development tool publisher Contemporary Software, have confirmed that many of their tools, widgets and report generating programs will work smoothly with Delphi, including Compression Plus 4, Fax Plus and Crystal Reports. 'Borland has been working very closely with Contemporary Software, and other tools vendors to ensure that there are the widest range of third party tools available for Delphi,' explained Guy Martin, Languages Product Marketing Manager at Borland UK. Other products are currently undergoing testing. According to Contemporary Software, Sheridan also plan to support Delphi with their suite of development tools (VBAssist, DataWidgets and others) 'as soon as Borland upgrades Delphi to work with Level 3 VBXs' - do they know something we don't?

The RAD Pack is retailing for around £149. For more information contact Borland Customer Services on 01734 321150, or peruse Borland Online at http://www.borland.com. Contemporary Software can be reached on 01727 811999.

DLLs in VB

Development tool company DataObjects has released version 1.5 of its VB/DLL Library Builder, a custom control add-on that enables a Visual Basic application to conceal its VB interior behind a C DLL interface, whilst retaining its full executable status. Like Windows DLLs, loading and unloading of the Visual Basic program is transparent. A single 32 K control instance can export as many functions as required. To a client program, the VB executable appears to be a normal DLL, meaning that Visual Basic functions can be called from any application that's written in a programming language which can call a Windows DLL. (See *Creating Windows DLLs using only Basic Source Code* further in this issue for the review of two other products.)

DataObjects intends VB/DLL to be used as an alternative to DDE or OLE automation for client/server or cross-application programming, or for building reusable libraries in VB, reducing code redundancy in large projects. An imminent version 2 uses the Winsock API to support RPCs across TCP/IP networks, allowing VB server applications to be moved to network servers without modification. Available from Grey Matter on 01364 654100 for £165.

Prolog for Windows

Most people remember Prolog either as something they used once or twice at college, or as an AI programming language they've heard of but never tried. One of the reasons Prolog and similar languages have always been fairly insular is that they traditionally require a single integrated environment for development, with little option for producing standalone applications or interacting easily with other software.

Two tools bringing Prolog into the everyday world of PCs and GUIs are Logic Programming Associates' WinProlog, and PDC's Visual Prolog 4.0 Professional Edition (recently licensed to the Open University for students studying Artifical Intelligence). WinProlog is a 32-bit implementation (even under Windows 3.1), with incremental compilation/linking and the capability of generating stand-alone programs which can be run outside of its IDE. Dynamic linking via DLLs and direct communication with any DDE-aware Windows application are supported.

Visual Prolog, currently in beta, offers even more to the developer - it's multi-platform, capable of targeting DOS, OS/2, NT and numerous UNIXs, and comes with resource editors and a suite of code 'experts'. A C or C++ program can call both your compiled Prolog code and PDC's standard library directly, if you feel like adding a declarative dimension to your C/C++ applications. OLE is also supported, and under OS/2, asynchronous IPC via named pipes.

LPA WinProlog 3.0 goes for £745, or £1,495 for the Developer Edition to produce stand-alone applications. PDC Visual Prolog 4.0 costs £670 for the Professional Version. You can speak to LPA on 0181 8712016, or e-mail them at lpa@cix.compulink.co.uk. Call PDC UK Distribution on 01603 219210.

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CIRCLE NO. 194

Letters

We welcome short letters on any subject that is relevant to software development. Please write to: The Editor, EXE Magazine, St. Giles House, 50 Poland Street, London W1V 4AX or email **editorial@dotexe.demon.co.uk** Unless your letter is marked 'not for publication', it will be considered for inclusion. Letters may be edited.

Patenteese

Dear Sir,

Regarding the article on the Unisys patent and GIF in the May issue of *EXE*, a great deal of inaccuracy does appear on page 24 in the section titled 'Patenteese'. In particular, that section states that the U.S. Patent Office failed to recognise that the IBM Miller/Wegman covers the same algorithm as the Unisys Welch patent. In fact, the Miller/Wegman patent is for a different invention that covered by Welch.

The U.S. Patent Office recognised this fact when it re-examined the Unisys Welch patent. Thus, the Miller/Wegman patent was reconsidered and made of record during the re-examination. As a result of the re-examination, on January 4, 1994, the U.S. Patent and Trademark Office confirmed the patentability of the original 181 claims in the 1985 Welch patent and the 55 claims added during re-examination.

It should also be pointed out that the European Patent Office considered the Miller/Wegman patent application during its examination of the Unisys European patent application and found the Unisys patent application to be patentable over the Miller/Wegman reference.

Mark T. Starr
General Patent & Technology Counsel
Unisys

The two patents might not - legally - cover exactly the same invention but it is commonly accepted that any LZW algorithm infringes both. Straight from the Frequently Asked Questions (FAQ) for the groups comp.compression and comp.compression.research: 'The IBM patent application was first filed three weeks before that of Unisys, but the US patent office failed to recognise that they covered the same algorithm. (The IBM patent is more general, but its claim 7 is exactly LZW.)'

From a software developer's point of view the main difference between the two patents is that Unisys started to enforce royalty payment on its patent while IBM hasn't so far done the same. We will soon have some articles on alternatives to the LZW algorithm for both graphic compression and more general use.

Fire buttons

Dear Sir,

An interesting article on page 21 in the January issue of *EXE* called 'More than a game...' showed how to access the games port of a PC. Using Visual C++ and the `_int86` instruction, I have successfully managed to read the four analogue inputs of the port. Unfortunately, however, I have been unsuccessful in reading the four digital inputs (i.e. joystick fire buttons) of the port. The article mentions that this is possible, but I cannot find a way of doing it. Please could you enlighten me on this subject.

Darren Sharpe
Nottingham NG6

The author, Michael Covington, replies: 'The button inputs (4 of them) are pins 2, 7, 10, and 14. These are TTL inputs with 1k pullup resistors; the other side of each button goes to ground, or you can even attach TTL-chip outputs to them. The data appear as the upper four bits of port hex 201. I can't remember if they're inverted.'

Bug or feature?

Dear Sir,

I know that *EXE* magazine is primarily intended for 'proper' programmers, but I would like to discuss Microsoft FoxPro for Windows.

I have been developing applications using FPW ever since its release, and I have found myself in an ever increasingly difficult battle against the bugs it appears to contain. The best support I have been able to obtain from Microsoft is via the Fox Forum on CompuServe, and in a recent message posted to the SYSOP I asked if there was a way of getting active support for FoxPro, i.e. if we report a problem to Microsoft then Microsoft should fix it, just as when one of our customers reports something is wrong with *our* software, we fix it.

The essence of the reply I received was: 'Microsoft does not supply the level of service you require....'

Am I right in thinking that if somebody supplies me faulty goods that they are liable in some way, or am I completely mad?

I believe that Microsoft has created an environment where use of its development products is often 'expected' by the application-buying public, so surely it must accept that it should support the developers who use them. When am I going to feel that Microsoft has taken its responsibilities seriously?

SJ Watts
Apache Solutions Ltd
Herts

There is no such thing as 'proper' and 'improper' developers. We do cover Fox Pro regularly (see EXE May '95 pp. 59-62). Regarding the main issue of your letter, i.e. support, this is a very complex issue. Most software companies do not sell software but only a right to use it. The only explicit warranty concerns media defects. Software houses are legally liable only for their software to perform as advertised, nothing more. In fact many companies, including Microsoft, sell different levels of support in addition to the basic price of the software. These specify the maximum period of time before they will return to you after you have requested service. But very few ever promise to correct bugs even though it is in their best interest.

The solution when you buy development tools is either to be ready to work around all the bugs that you will find, secure an agreement with the tool vendor to guarantee timely support or go for a tool which is given with its source (such as the FSF's GNU tools). A long-term option is to create a user group to be able to put pressure on the tool's company. Of course, this whole situation is totally inadequate for software developers who have their own bugs to contend with.

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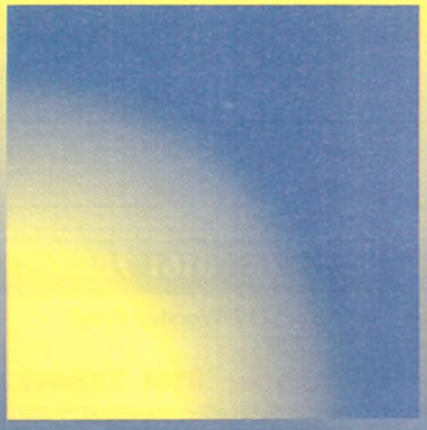

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Wireless & Wired

Wireless mobile phones and laptop computers can now be wired together. **David Mery** shows how to take advantage of the combination of the two.

At the office you have access to email, to voice communication, to data transmission... As soon as you walk away from your desk you lose most of these facilities. The main reason is that you need to have lots of equipment tethered to different wall plugs: a computer to at least one network connector, a modem, and a phone to one or more phone plugs, etc. With today's technology - mobile phones and portable computers - there's no reason why you shouldn't have access to all these capabilities and more, whether 50 feet or 500 miles away from your desk.

What can be done when a mobile phone is controlled by a laptop? Data transfer is an obvious application, but for anyone who stores and manages his dialling directory in a mobile phone, access to the phone's directory is equally important. Digital cellular phones such as GSM (Vodafone and Cellnet) and PCN (Hutchison's Orange and Mercury's One2One) also offer the capability of transferring short messages between two phones when available on the network. This service, SMS (Short Messages Service) is a good candidate as a function which can be managed from a computer. Entering a message from a phone keypad, even if only 160 characters, can be tiresome.

In this article I'll look in more details at two offerings provided by Nokia Mobile Phones. One comprises of a PCMCIA data card and cable to link the data card to a Nokia GSM or PCN phone. The data card provides data and SMS capabilities. The other one is made up of a serial cable linking the phone directly to the serial port of a computer and a TAPI driver.

I tested the two setups with a GSM Nokia 2110 on Vodafone and an Orange PCN Nokia 2140 phones. The serial link only worked with the GSM phone. It requires version 4.76 or better, of the firmware and the PCN phone I had was only 4.67 (the GSM had a revision 4.90). You can check which version of firmware your phone has by typing '`*#9999#`' on the phone's keypad.

Wireless data

Data transfer is completely transparent. Insert the PCMCIA data card into a laptop, connect the cable to the card and the phone and you're ready to use any standard communications application. The phone then acts as a 9,600 bps modem. The link from your computer up to the network communication centre is completely digital, so in fact the phone/data card is behaving more like an ISDN terminal adapter (TA) than a MOdulator-DEModulator (see Figure 1). All of the basic AT command set, standard with both modems and TAs, is recognised.

The data card currently supports one proprietary command `AT*C` to control the SMS. In the future Nokia will support the official 'AT Command Set for GSM Mobile Equipment', but probably not before the standard is finalised, nearer the end of this year. The current proposal for these AT extensions, dated March 15, has been written by Nokia, Ericsson and Hewlett-Packard. It defines the `AT+C` extensions (see Table 2).

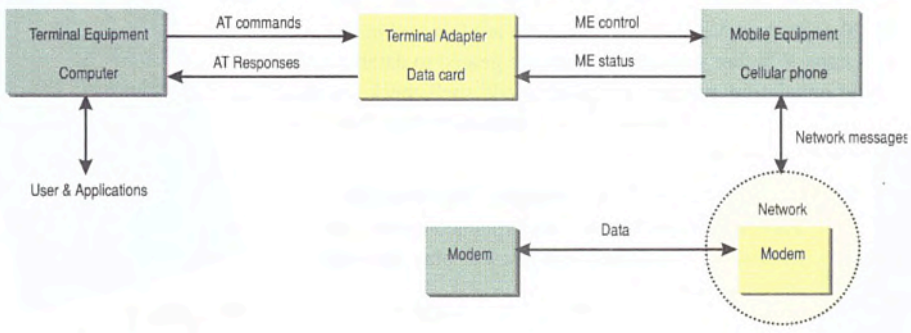

Figure 1 - Mobile data setup

Taking control with TAPI

The second setup, with the serial link, doesn't allow data transmission but gives access to quite a few features of the phone. This option is currently in final beta test. It's completely operational; Nokia just hasn't yet decided on the complete list of functions which will make the distribution release. The software interface is based on Microsoft's TAPI (Telephony API). This is one of the two specific APIs proposed as standardised means of information exchange between phone networks and computers. One is Windows specific: TAPI, while the other is NetWare specific: TSAPI (Telephony Services API). Most new applications conform to one of these but some work is also done outside these standards.

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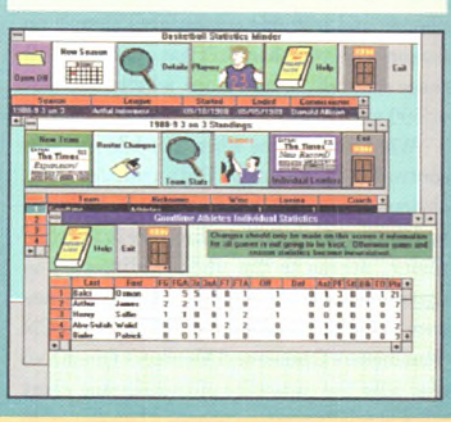

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TAPI includes a set of general functions which are available with most telephony devices, such as dialling and answering a call, as well as a standardised way of adding extensions. With the basic TAPI functions a call can be initiated on the mobile phone, using TAPI SDK's dialler sample application. To control all the more specific features of Nokia's phones, Nokia's TAPI driver adds TAPI functions at the Service Provider Interface (SPI) level (see Figure 2). These functions give access to the short-code memory (phonebooks), to keyboard, display, tones and audio settings, to the short messaging service (SMS) and to other miscellaneous functions (Roaming mode, InService/OutOfService information, MsgWaitOn/MsgWaitOff status).

To use Nokia's driver, the TAPI SDK must be installed first. It can be retrieved from the WINEXT forum on CompuServe or from Microsoft's own Web site (at the URL http://www.microsoft.com). If Windows crashes when you install the Telephony applet in the Control Panel, check that you do not have too many applets installed already. There's an undocumented limit to the number of applets that can be initialised at one time. When there are too many, Windows runs out of stack space and crashes with no clear diagnostic. This is what happened to me! Another solution is to launch CONTROL.EXE from the File/Run menu option in the Program Manager with the name of the applet, TELEPHON.CPL, as a parameter.

Once all this has been sorted out you can at last focus on developing your application. Listing 1 shows excerpts from a sample program written by Nokia to read and write the phone memory. The code shown here includes only the general TAPI code and the code to read the phone memory. Let's walk through it.

Asynchronous events

The function `bInitTAPI` starts by defining a TAPI callback procedure, to be invoked when a TAPI event occurs. This mechanism is provided for asynchronous calls which do not perform any actions immediately. Any call which requires an action taken by the telephony device can take ages to return. The `lineInitialize` function passes the pointer to the callback to TAPI and returns immediately with the number of line devices available to the application. Then, since we want to use TAPI extensions defined by Nokia, we have to negotiate the extension version needed. This is the role of the `lineNegotiateAPIversion` and `lineNegotiateExtVersion` functions. The first call will return a pointer to a `LPLINEEXTENSIONID` structure containing the ids of provider-specific extensions. The second call negotiates the version of these extensions that will be called by the application.

The last step of the initialisation process is to call `lineOpen` to open the line device. The line handle returned by `lineOpen` is used in all subsequent TAPI calls. Two of the parameters are worth mentioning. The first one, `LINECALLPRIVILEGE_OWNER`, concerns only incoming calls. `OWNER` means that the application wants to own all incoming calls of the type set by the next parameter. To set the type of calls of interest to the application, we need to set the right flags in the `dwMediaModes` parameter. This is done with `LINEMEDIAMODE_INTERACTIVEVOICE`. If we hadn't known what service the connected device was offering, especially what type of media mode was supported, we should have issued a `lineGetDevCaps` beforehand. This returns all the telephony capabilities of the line device in a `LINEDEVCAPS` structure.

The `ReadMem` function works by asking TAPI to perform the extended function `SCMFUNC_READMEM`. When the memory reading has been done, TAPI will invoke the callback function. This is an example of how to call a Nokia specific function and how the asynchronous calling mechanism works. The first step is to initialise the structure pointed by `lpReadMemParams`. This pointer will be passed to TAPI. The structure is initialised with the read memory specific function id code, the type of memory that we want to read (the phone's own memory, or the one of the SIM card present in the phone) and the memory range. The `lineDevSpecific` API is an Extended Telephony services function provided specifically as an extension mechanism. It just tells TAPI to pass the information to the Nokia driver. Use of `lineDevSpecific` makes an application non-portable, i.e. it can't use other TAPI devices but that's its *raison d'ëtre:* to access functions that are present in just one specific device.

Next is an abridged version of the callback function. It first checks if it has been called to report the results of a previous function call which completed asynchronously. This is the reason of the `case LINE_REPLY`. In the `case` statement the `if (dwParam1 ...)` checks which functions originally called TAPI, in

AT command set extensions

Modem control has gone a long way since Hayes introduced the **AT** command set in 1981 with the Smartmodem 300. Most of the basic standard commands have now been codified in the recent V.25*ter* recommendation of the ITU-TSS (see Table 1). At the same time, several standardisation groups have worked on defining extensions to the basic command set. These extensions cover a wide range of activity where communication is involved and go much further than just controlling a modem. Extensions includes the well known **AT+F** commands for fax control. But that's not all, voice and wireless communication management are just two other examples of the work that has been done.

Table 2 should help you to find which new extensions might be relevant for any planned development. The table also gives references to the different standards. This is key information when trying to find more documentation. For instance on the ITU Web site (http://www.itu.ch/), all the documents are accessed either by a number or by moving through a hierarchy modelled on the group organisation of the ITU.

Beware of still-born standards. Before deciding to comply with a one, check that products are available or your - communications - application may be *lonely*. For instance, to this date there's no commercially available product which conforms to the **AT+C** extensions, even though several mobile phone manufacturers have data adapter in their catalogue and the need is there.

Acronym	*Meaning*
ETSI	European Telecommunications Standards Institute
GSM	Global System Mobile, a part of ETSI
IS	Interim (Trial Use) Standard
ITU-T	Short for ITU-TSS. International Telecommunication Union - Telecommunication Standardisation Sector
MSC	Modem Standards Committee
PCCA	Portable Computer and Communications Association
PN	Project Number
SMG	Special Mobile Group
TIA	Telecommunications Industry Association

Table 1 - Organisations acronyms

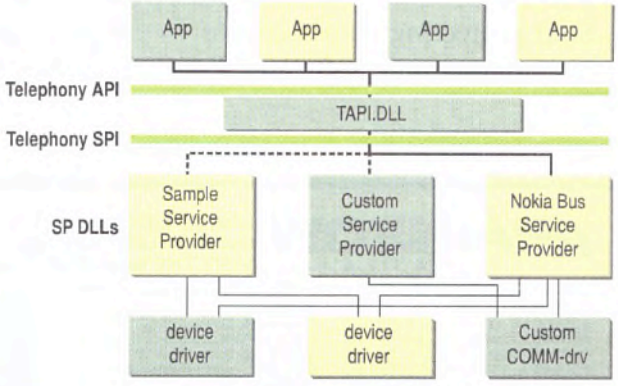

Figure 2 - TAPI setup

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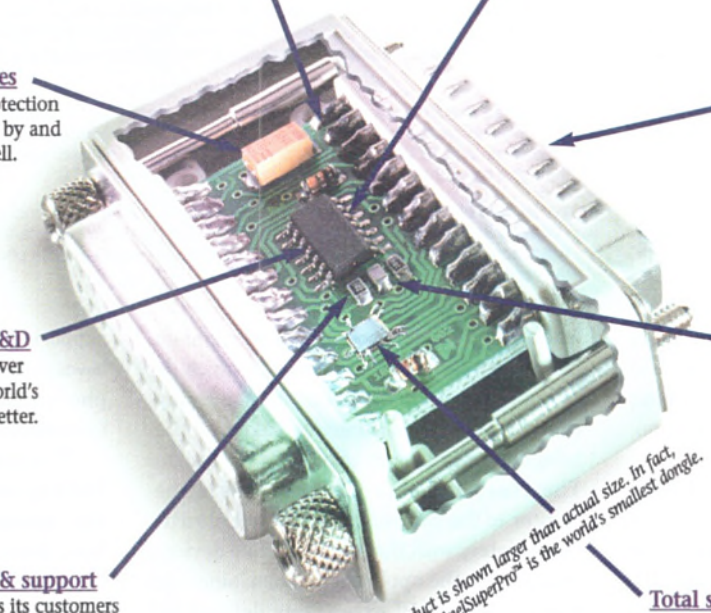

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this example there's only one possibility: the `ReadMem` function. Its main action consists of sending a message to the main window of the application which will in its turn process the results by displaying the contents of the phone's memory in a *nicely* drawn dialog box.

An important but straightforward function is `LineErrorMsg` to report in a clear way to the application's user any error generated by TAPI. There's a large selection!

`DeinitTAPI` is called just before exiting the program. It issues a `lineClose` to close the line device opened with `lineOpen`, and `lineShutdown` so that TAPI knows that it will no longer be used by this application and can free any memory it had reserved.

Generic or specific?

Developing an application to use in conjunction with a mobile phone is pretty straightforward, either using the AT command set with the data card or TAPI with the serial link. As can be seen above there's no real mystery with either programming model. So the question is what type of application to develop? One approach is to adapt existing 'communicating' programs to work with mobile phones. This should require few, if any, modifications and they will be trivial. The other approach is to use the more specific attributes of the digital mobile phones. This implies that the application will be specific to a single phone manufacturer but it is a more interesting approach. It allows developers to create, for instance, an application which reads the phone number of an

```
// Copyright (c) 1995.  Nokia Mobile Phones Ltd.

#include <windows.h>
#include <tapi.h>
#include <nokiabus.h>
#include "global.h"
#include "scmedrc.h" // Resource identifiers

HLINEAPP   hLineApp; // TAPI application handle
SCMFUNC_MEMORYSTATUS_PARAMS MemoryStatusParams;
                     // TSP parameter struc
DWORD  dwNumLines;          // Number of line
                            // devices available
DWORD  dwExtVersion;        // TSP version #
DWORD  dwApiVersion;        // TAPI version #
LONG   lReadMemReqId;       // TAPI request ID's
LINEEXTENSIONID LineExtensionId;
                           // TSP extension ID
HLINE  hLine;              // Line device handle

// TAPI callback function
VOID FAR PASCAL _export LineCallBack(
       DWORD hDevice, DWORD dwMsg,
       DWORD dwCallbackInstance,
       DWORD dwParam1, DWORD dwParam2,
       DWORD dwParam3);

// function to report error messages to the user
void LineErrorMsg( LONG lResult);

// ========================================

BOOL bInitTAPI( void)
{
 // Initialises the TAPI Line device,
 // negotiates version numbers for the
 // TAPI and TSP and opens the line.
 LONG          lReturn;
 LINECALLBACK   lpfnLineCallBack =
      (LINECALLBACK)MakeProcInstance(
            (FARPROC)LineCallBack, hInstance);

 // Initialise the TAPI line device
 if( 0 != lineInitialize( &hLineApp, hInstance,
         lpfnLineCallBack,
         lpszAppName, &dwNumLines))
   {
   hLineApp = NULL;
   }
 else
   {
   // Negotiate TAPI version
   lReturn = lineNegotiateAPIVersion( hLineApp,
        0,               // line device id
        0x00010003L,     // low version #
        0x00010003L,     // high version #
        &dwApiVersion,   // returned version #
        &LineExtensionId  // returned TSP
                          // extension in structure
          );
   if (lReturn)
     {
     LineErrorMsg( lReturn);
     lineShutdown( hLineApp);
     hLineApp = NULL;
     }
   else
     {
     if (LineExtensionId.dwExtensionID0 == 0 &&
        LineExtensionId.dwExtensionID1 == 0 &&
        LineExtensionId.dwExtensionID2 == 0 &&
        LineExtensionId.dwExtensionID3 == 0)
        {
        MessageBox( NULL,
                    "TSP Extensions not found!",
                    "Error", MB_OK);
        }
     else
        {
        // Negotiate TAPI TSP extensions version
        lReturn = lineNegotiateExtVersion(
             hLineApp,
             0,            // line device id
             dwApiVersion, // API version
                           // negotiated ear-
lier
             0x00010003L,  // low version
             0x00010003L,  // high version
             &dwExtVersion);
        if (lReturn) { LineErrorMsg( lReturn); }
        }
     }
   }

 if (hLineApp)
   {
   // Open the line
   lReturn = lineOpen( hLineApp, 0, &hLine,
                dwApiVersion, 0, 0,
                LINECALLPRIVILEGE_OWNER,
                LINEMEDIAMODE_INTERACTIVEVOICE,
                NULL);

   if (lReturn < 0)
     {
     // In case of error, output an err message
     // and deinitialise TAPI
     LineErrorMsg( lReturn);
     DeinitTAPI();
     return FALSE;
     }
   return TRUE;
   }
 return FALSE;
}

// ========================================

void ReadMem( void)
{
 // Reads Phone/Sim SCM memory locations
 // into the global memory SCM buffer.
 LONG lResult;

 // Set the parameters
 lpReadMemParams->dwFunctionID =
                                SCMFUNC_READMEM;
 lpReadMemParams->dwPhoneMemory =
                                dwPhoneMemoryType;
 lpReadMemParams->dwMemoryStart = dwMemoryStart;
 lpReadMemParams->dwMemoryEnd = dwMemoryEnd;

 // and call the TAPI function
 lResult = lineDevSpecific( hLine, 0,
             NULL, lpReadMemParams,
             sizeof (SCMFUNC_READMEM_PARAMS));
 if (lResult < 0) LineErrorMsg( lResult);
 if (lResult > 0) lReadMemReqId = lResult;
 if (lResult <= 0) SendMessage( hMainWnd,
             WM_COMMAND, IDT_READDONE, lResult);
 return;
}

// ========================================

VOID FAR PASCAL _export LineCallBack(
                       DWORD hDevice,
                       DWORD dwMsg,
                       DWORD dwCallbackInstance,
                       DWORD dwParam1,
                       DWORD dwParam2,
                       DWORD dwParam3)
{
 // This is the TAPI callback function. Receives
 // & processes messages from the TAPI and TSP.
 switch (dwMsg)
   {
   case LINE_REPLY:  // Some function completed
                     // asynchronously

     if (dwParam1 == (DWORD)lReadMemReqId)
        // ReadMem()
        {
        // Redraw the listbox
        SendMessage( hMainWnd, WM_COMMAND,
                     IDT_READDONE, dwParam2);
        lReadMemReqId = 0;
        switch (dwParam2)
          {
          case 0:
            break;
          default:
            break;
          }
        }

   //... Other functions implemented here ...

   default:
     break;
   }
 return;
}

// ========================================

void LineErrorMsg( LONG lResult)
{
 // Reports a TAPI error to the user
 // by a Windows MessageBox
 char szErrorMsg[1024];

 switch (lResult)
   {
   case LINEERR_UNINITIALIZED:
     wsprintf( szErrorMsg,
               "TAPI LINE not initialised.");
     break;
   // ... other error messages ...
   default:
     wsprintf( szErrorMsg, "Other error.");
     break;
   }
 MessageBox( NULL, szErrorMsg,
             "TAPI LINE Error!", MB_OK);
 return;
}

// ========================================

void DeinitTAPI( void)
{
 // Deinitialises TAPI by closing the line
 // and shutting down the application
 lineClose( hLine);
 lineShutdown( hLineApp);
}
```

Listing 1 - Main TAPI functions needed to read the directory memory of a Nokia digital cellphone

+A, +D, +E, +G, +I, +M, +S	
Scope	General modem use (DTE-DCE Interfaces
References	ITU-T V.25ter subsumes the contents of TIA-602 (basic Hayes set), TIA 615 (extension rules) and TIA IS-131 (particulars including +M, +I, +G, +E and +D). +A is described in the project PN-2989 from TR-30.4.
+F	
Scope	Group 3 facsimile digital interfaces (Class 1 and Class 2)
References	ITU-T T.31 (superset of TIA-578-A) and T.32 (superset of TIA-592, TIA-605 and TIA IS-134). This was originally described in TR-29.2.
+V	
Scope	Voice control
References	Current published version is TIA-IS-101-1993 but the current committee version is TIA-PN-3131R3. This project was moved from TR-29.2 to TR-30.4 for merger with work on conferencing modems (+S). It will become a contribution to ITU SG14.
+C	
Scope	TDMA, Spread Spectrum and Global System Mobile digital cellular
References	TIA TR-45.3 handles US-TDMA and TIA TR-45.5 handles US-CDMA. Work is in progress with SMG4 of ETSI regarding GSM digital cellular data (the data service document is called IS-99).
+W	
Scope	Wireless communications services (commands to chose wireless networks and services, for general wireless use, and for analogue cellular).
References	This work has moved from PCCA MSC STD-101 into TR-30.4 as PN-3499.

Table 2 - References for AT command set extensions (compiled with the help of Joe Decuir, Charlie Garthwaite, Petri Heinonen and Bill Pechey)

incoming call (CLI) and log the details of the call (duration, notes...). The same application could also automatically send a short message (SMS) to another phone giving the phone number and the name of the caller, retrieved from a database. This could be used in an office with several phones when someone wants to take some time off incommunicado...

Let's face it, the world is not yet saturated with mobile communication applications. This despite the fact that all the tools are ready today to create software that would bring all the new functionality to the end user. There are lots of opportunities for the imaginative developers.

For more information on Nokia developer's program check out http::/ /www.nokia.com or email cellular.partner@nmp.nokia.com. The phone illustrations are pictures of an Orange Nokia 2140 which can be found on http:/ /info.mcc.ac.uk /Orange /. They are reproduced with the permission of Robert Goodwin.

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Developing...

...Stored Procedures for Microsoft SQL Server

Microsoft SQL Server now lets you go a long way beyond standard SQL syntax. **Mike Campbell** explains how it is even possible to reach the Win32 API.

MICROSOFT SQL Server for the Microsoft Windows NT operating system is a powerful, scaleable relational database platform. It offers greater ease of use and manageability (through several graphical tools) than more traditional database platforms and can be used to develop distributed client/server applications. This article discusses how to create extended stored procedures for Microsoft SQL Server.

SQL (Structured Query Language) is a high level language for relational database systems. Originally developed in the mid-1970s, SQL has been adapted for many relational database management systems (RDBMS). It has proved to be a powerful language capable of coping with some of the most intricate programming problems. A number of RDBMSs have further enhanced standard ANSI SQL by providing their own versions which introduce some aspects of procedural languages (MS SQL Server provides Transact-SQL and ORACLE provides PL/SQL). However, for some requirements, even these enhanced SQL dialects are not powerful enough.

In SQL Server, using Transact-SQL, you can gain access to a wealth of information about the SQL Server environment (the number of logins or attempted logins since start-up, the name of the local SQL Server, even the server process id of the current process). But what if you wanted to find out something that SQL Server didn't tell you, or react to a condition in a way that SQL Server didn't allow you to? Ever wanted to know what chip was inside the machine that SQL Server was running on? No? Well possibly something more useful (only just) would be the ability to invoke a mail session and send a message to a particular person based on certain conditions in your SQL Server database. The message could be built dynamically at run-time based on current values in the database.

This kind of functionality could be very useful from a business point of view. For instance it could be invoked when a company's stock levels drop below a certain level and the mail message could be an order sent directly to a supplier's fax machine. Or perhaps in a financial environment, it could be some kind of notification message indicating instrument price changes.

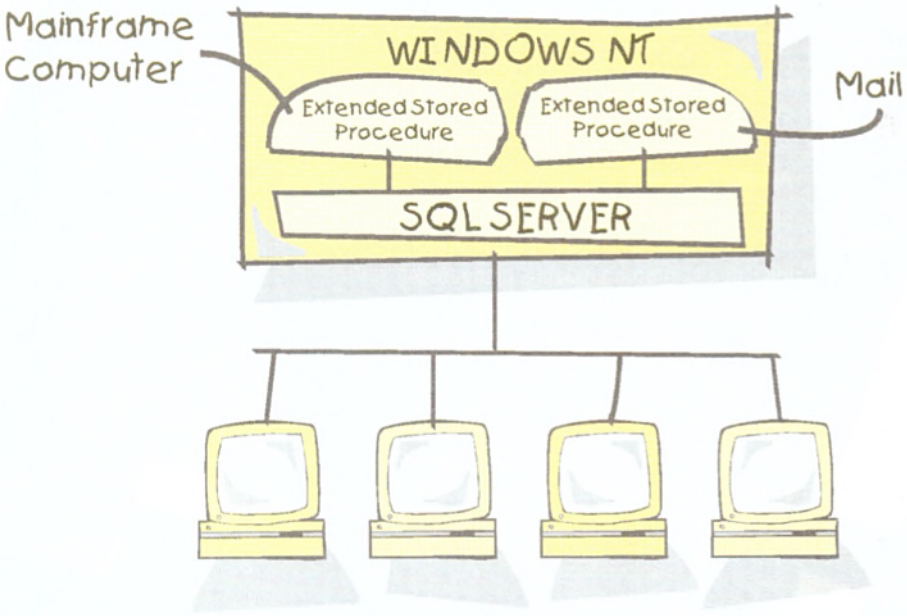

Figure 1 - Schematic diagram showing how extended stored procedures can be used to access NT services

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Extended Stored Procedures

These ideas can be implemented in SQL Server by using extended stored procedures. Extended stored procedures are functional extensions that you can write and add to SQL Server. These extensions can then be integrated into your database applications to add functionality that otherwise would not be directly available.

The procedures are essentially dynamic-link libraries (DLLs) which provide a way to extend the capabilities of SQL Server using the Microsoft Open Data Services (ODS) Application Programming Interface (API). The Microsoft ODS API consists of C functions and macros which can be used to create extended stored procedure DLLs that are added directly to the standard SQL Server DLLs. Users can then call these extended procedures in the same way they would call standard stored procedures (written using Transact-SQL). From the extended procedure, the programmer can access other APIs (e.g. Win32) to provide the required processing.

Figure 1 provides a schematic diagram of how a client PC can connect across the network to SQL Server running on Windows NT and access extended stored procedures to trigger external actions.

Tools

Although an extended procedure can be written and compiled in one environment (I used Microsoft Visual C++ for windows NT), it is actually part of the client/server chain and as such, a number of different environments/platforms will be required to complete the development. The actual procedure requires a Windows NT C compiler along with the Microsoft ODS library. SQL Server for Windows NT (as well as Windows NT itself!) is also quite important as this is what you're going to plug the extended procedure into.

A Sample Procedure

The sample procedure discussed is designed to demonstrate a number of techniques using a simple example. It shows how you can:

- Validate parameters passed into the procedure
- Use the Win32 API to do some processing
- Define, create and populate a SQL Server result set
- Return the result set to SQL Server

One row of data is returned to SQL Server containing the version number and platform for the operating system that SQL Server is running on. In itself, it is not very useful but it does illustrate some important parts of developing extended stored procedures. To retrieve the operating system information, the Win32 function `GetVersion()` is used.

As you can see from the code listings, there are actually two functions in the DLL, `xp_cbs_test_proclist()` and `xp_cbs_test()`.

The first function, `xp_cbs_test_proclist()`, returns a list of all the extended stored procedures in the DLL and their usage. The sample procedures supplied with the Microsoft ODS use this '`proclist`' (procedure-list) idea which is a useful convention because it allows developers to examine extended procedures to see what they do and how they are called. With standard stored procedures, a developer can simply open the code (using something like SQL Object Manager) to see what it does and what parameters it takes; however with extended procedures being compiled code, it becomes more difficult to get at this information.

The function `srv_rpcparams()` tells you the number of arguments that have been passed to the procedure. Unlike normal stored procedures, where SQL Server will validate user-specified parameters and return syntax errors, extended procedures

```
#include "xpTest1.h"
//========================================
RETCODE xp_cbs_test_proclist(srvproc)
  SRV_PROC *srvproc;
{
  int paramnum;
  DBCHAR colname1[MAXNAME];
  DBCHAR colname2[MAXNAME];
  int i;
  // Get number of parameters
  //
  paramnum = srv_rpcparams(srvproc);
  // Check number of parameters
  //
  if (paramnum != -1) {
  // Send error message and return
  //
    srv_sendmsg(srvproc, SRV_MSG_ERROR,
      XP_CBS_TEST_PROCLIST_ERROR,
      SRV_INFO, (DBTINYINT)0,NULL, 0, 0,
      "Error executing extended stored \
procedure: Invalid Parameter",
      SRV_NULLTERM);

    // A SRV_DONE_MORE instead of a
    // SRV_DONE_FINAL must complete the result
    // set of an Extended Stored Procedure.
    //
    srv_senddone(srvproc,
     (SRV_DONE_ERROR | SRV_DONE_MORE), 0, 0);
    return(XP_ERROR);
  }
  sprintf(colname1, "spname");
  srv_describe(srvproc, 1, colname1,
    SRV_NULLTERM, SRVCHAR, MAXNAME,
    SRVCHAR, 0, NULL);
  sprintf(colname2, "spusage");
  srv_describe(srvproc, 2, colname2,
    SRV_NULLTERM, SRVCHAR, MAXLEN, SRVCHAR,
    0, NULL);
  // Return each XP handler as a row
  //
  for (i = 0; i < Xpcnumber; i++) {
    srv_setcoldata(srvproc, 1, Xps[i].name);
    srv_setcollen(srvproc, 1,
                  strlen(Xps[i].name));
    srv_setcoldata(srvproc, 2, Xps[i].usage);
    srv_setcollen(srvproc, 2,
                  strlen(Xps[i].usage));
    srv_sendrow(srvproc);
  }

  // A SRV_DONE_MORE instead of a
  // SRV_DONE_FINAL must complete the result
  // set of an Extended Stored Procedure.
  //
  srv_senddone(srvproc,
    (SRV_DONE_COUNT | SRV_DONE_MORE), 0, i);
  return(XP_NOERROR);
}
```

Listing 1 - Function `xp_cbs_test_proclist`, which returns a list of all the extended stored procedures in the DLL

```
RETCODE xp_cbs_test(srvproc)
SRV_PROC *srvproc;
{
  char szOSVersion[10];
  char szOSPlatform[30];
  DWORD dwVersion;
  int paramnum;
  DBCHAR colname1[MAXNAME];
  DBCHAR colname2[MAXNAME];
  // Check number of parameters
  if ((paramnum = srv_rpcparams(srvproc))
                                != -1) {
    // Send error message and return
    srv_sendmsg(srvproc, SRV_MSG_ERROR,
        XP_CBS_TEST_ERROR,
        SRV_INFO, (DBTINYINT)0,NULL, 0, 0,
        "Error executing extended stored\
 procedure: Invalid # of Parameters",
        SRV_NULLTERM);
    srv_senddone(srvproc,
      (SRV_DONE_ERROR | SRV_DONE_MORE),
        0, 0);
    return(XP_ERROR);
  }
  // Get Version info
  dwVersion = GetVersion();
  // Get OS Version
  wsprintf((LPTSTR)szOSVersion,
    (LPCTSTR)"%d.%d",
    LOBYTE(LOWORD(dwVersion)),
    HIBYTE(LOWORD(dwVersion)));
  // Get OS Platform
  if (HIWORD(dwVersion) & 0x8000)
    strcpy(szOSPlatform,
          "Win32s on Windows 3.1");
  else
    strcpy(szOSPlatform,"Windows NT");
  // Create and fill columns. Then return
  // results
  sprintf(colname1, "OS_Platform");
  srv_describe(srvproc, 1, colname1,
    SRV_NULLTERM, SRVCHAR, MAXNAME,
      SRVCHAR, 0, NULL);
  sprintf(colname2, "OS_Version");
  srv_describe(srvproc, 2, colname2,
    SRV_NULLTERM, SRVCHAR, MAXNAME,
      SRVCHAR, 0, NULL);
  // Assign data to columns
  srv_setcoldata(srvproc, 1, szOSPlatform);
  srv_setcollen(srvproc, 1,
                strlen(szOSPlatform));
  srv_setcoldata(srvproc, 2, szOSVersion);
  srv_setcollen(srvproc, 2,
                strlen(szOSVersion));
  // Return row
  srv_sendrow(srvproc);
  // Done !!
  srv_senddone(srvproc, SRV_DONE_MORE,
      0, 0);
  return(XP_NOERROR);
}
```

Listing 2 - Function `xp_cbs_test`, which returns the server OS name and version

```
// Include files
//
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <ctype.h>
#include <windows.h>
#include <srv.h>
// Miscellaneous defines
//
#define  XP_NOERROR     0
#define  XP_ERROR       1
// Maximum extended procedure name length
#define  MAXNAME        31
// Maximum string length
#define  MAXLEN         80
// Extended procedure error codes
//
#define  SRV_MAXERROR  20000
#define  XP_CBS_TEST_PROCLIST_ERROR  \
                    SRV_MAXERROR + 1
#define  XP_CBS_TEST_ERROR   \
                    SRV_MAXERROR + 2
// Standard error macro for reporting API

// errors
#define SETERROR( api, retstring)     \
  sprintf(retstring,\
    "%s: Error %d from %s on line %d\n",  \
    __FILE__, GetLastError(), api, __LINE__);

// Stored Procedure information structure.
//
typedef struct xp_info {
// Extended procedure name
    DBCHAR name[MAXNAME];
// Usage string
    DBCHAR usage[MAXLEN];
} XP_INFO;
// Array of Extended Stored Procedures
// supported by this DLL.
//
XP_INFO Xps[] =
{   // Procedure name
    "xp_cbs_test_proclist",
    // Procedure usage string
    "usage: xp_cbs_test_proclist",
    // Procedure name
    "xp_cbs_test",
    // Procedure usage string
    "usage: xp_cbs_test",
};
#define Xpcnumber \
  sizeof(Xps) / sizeof(XP_INFO)
```

Listing 3 - Include file for extended procedure DLL

need to carry out this validation for themselves. `srv_sendmsg()` is used to send messages back to SQL Server and in this case is used to flag an invalid number of parameters.

Next the Win32 function `GetVersion()` is used to retrieve the operating system information. The creation of the result set to return the information to SQL Server is done using a series of ODS function calls. First, for each column to be returned, a variable of type `DBCHAR` needs to be created. In this case the variables are called `colname1` and `colname2`.

The column names are then assigned to these variables using the function `sprintf()`. Function `srv_describe()` is then used to define the column's characteristics (e.g. the data type). Once defined, data can be put into the column using the functions `srv_setcoldata()` and `srv_setcollen()`. When data has been assigned to all the columns, the result set row can be returned to SQL Server using function `srv_sendrow()`. When all rows have been returned, the function `srv_senddone()` is called to signal the end of the result set.

Once written, the procedure needs to be compiled into a dynamic-link library. The ODS library (OPENDSNT.LIB) needs to be linked in as well to support the ODS function calls used. The final DLL file can then be copied into the SQL Server DLL directory and is ready for use.

The code in Listing 3 shows the header file for the extended procedure.

Calling the Sample Procedure

Before running the procedure, it needs to be added to SQL Server using an SQL script. This needs to be written in SQL Server Transact-SQL language and can be created in Notepad or any other text editor. Figure 2 shows a script for adding the sample procedure.

There are a variety of ways in which extended stored procedures can be accessed but probably the simplest way, especially while developing the procedure, is to use SQL Object Manager which comes with SQL Server. Figure 3 shows SQL Object Manager running the procedure and the results returned.

Alternatively, you could choose to build an application from a number of front-end (client) tools available (e.g. Visual Basic or Access) and call your extended procedure from this application. To connect to SQL Server over the network you would have to use some kind of connectivity layer like the Microsoft Open Database Connectivity (ODBC) API or DB-Library.

Conclusion

Extended stored procedures provide a very powerful mechanism for extending the functionality of SQL Server. Because executing an extended stored procedure is similar to executing a standard stored procedure, the consistency of the interface makes them easy to use for the SQL Server user. Administration of extended procedures is also easier because they can be added or dropped by the system administrator in the same way as standard stored procedures.

By accessing the Win32 or other APIs, an extended stored procedure can be made to do almost anything a conventional C program can do. As you can imagine, the possibilities are endless and only limited by the imagination and skill of the developer.

These extensions allow you to develop applications that match business processes much more accurately and also allow you to automate more of these processes, making SQL Server suitable for a wide variety of business uses. ■

Mike Campbell is a freelance consultant who specialises in development using Microsoft products in particular Windows NT, SQL Server and Visual C/C++. He can be reached on the Internet as dx93@cityscape.co.uk or on CompuServe as 74002,3612.

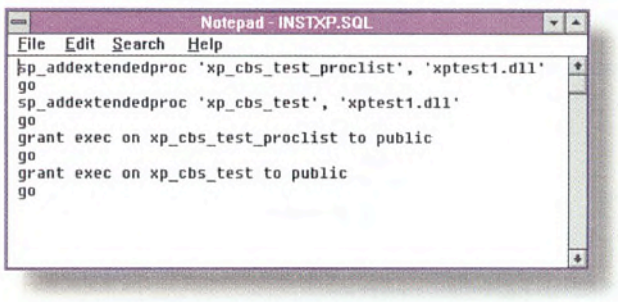

Figure 2 - Adding a procedure to SQL Server

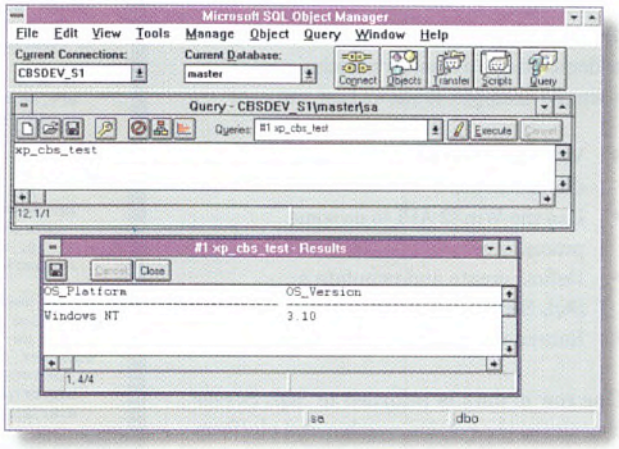

Figure 3 - Running a procedure from SQL Object Manager

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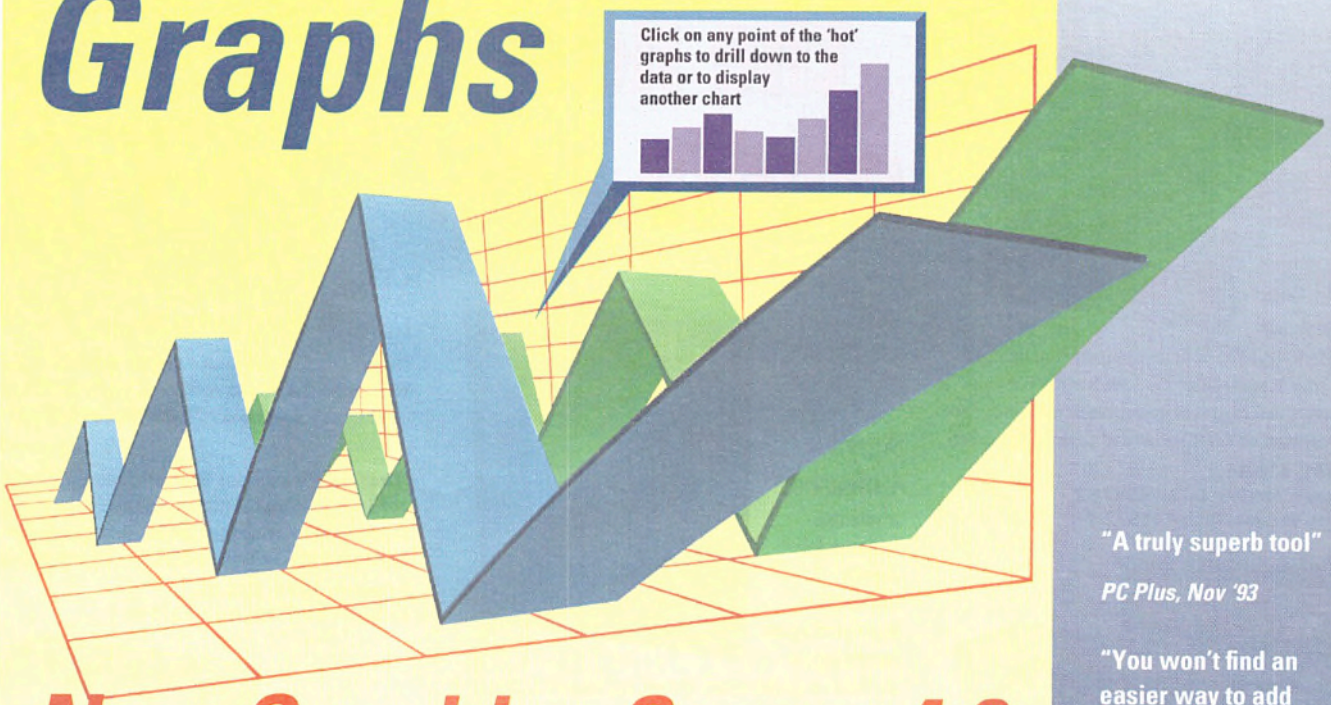

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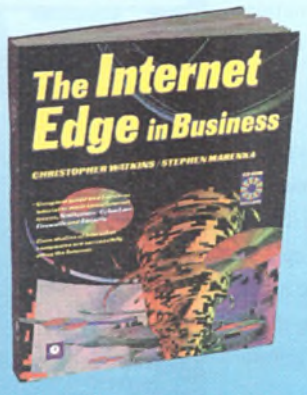

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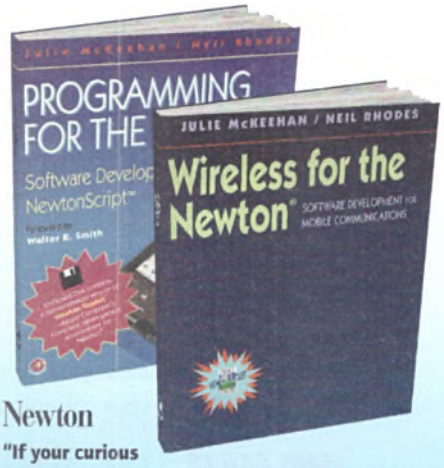

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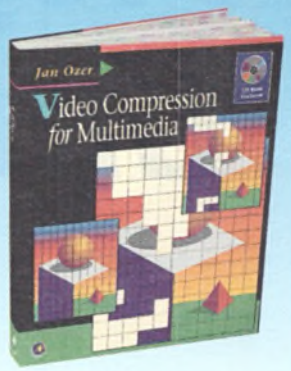

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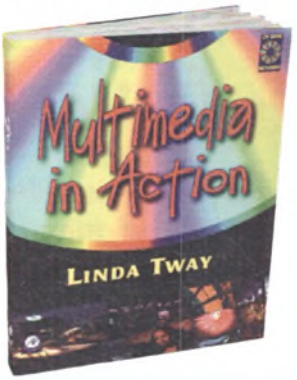

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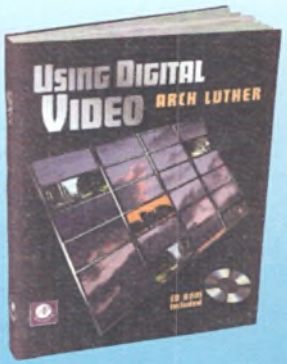

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CIRCLE NO. 203

HyperText Markup Language 3.0

The evolution of HTML has been led by Web site developers. HTML 3.0 is the proposed new version that incorporates many of the features that they have requested. **Paul Richardson** has a go at them.

It seems like only yesterday that I was writing my last article on HTML (*EXE December '94*); however, in the realm of the Internet, things don't stand still for long. Now that the big money in commerce has recognised the potential for gaining a competitive edge through WWW technology, Web page developers are clamouring for new features in HTML that give them more control over the presentation of the material they publish.

The missing features most asked for were: table support, the display of mathematical expressions and text flow around figures. It should come as no surprise that the draft specification for HTML 3.0 tackles all these issues and more.

Given that HTML 3.0 is no more than a draft Internet Engineering Task Force (IETF) document, it may seem too early for a whole article; however, HTML 3.0 has been under consideration for some time, and support for many of its features has already found its way into existing browsers (eg. Netscape).

The new features have added considerable complexity to the language, and a full reference guide would be the subject of a small book. Hence this article cannot be a complete specification but it should give a flavour of the new capabilities of the language by introducing new concepts. For the full specification, follow the links in the bibliography.

HTML history

The features contained in the various versions of HTML is not a precise matter as firm specifications and versioning have only recently been applied. However, in a hand-waving manner, it is possible to say that HTML 2.0 is what we have become used to seeing supported by the traditional mainstream browsers such as Mosaic. HTML 1.0 was essentially the same as version 2.0 without the capability of user input via forms.

For quite some time now, say 18 months or so, the idea of *HTML+* has been batted around, provoking discussion of what should be in the version of the language that succeeds HTML 2.0. It was only on the 28th March 1995 that the fruit of all these discussions was put forward by Dave Raggett as a representative of the World Wide Web Consortium to the Internet community in the form of an Internet Draft entitled *HyperText Markup Language Specification Version 3.0*.

Internet Drafts are the working documents of the Internet Engineering Task Force, and as such will be subject to modification before being ratified as the specification to adopt. However, the fact that the HTML+ specification has been around for some time now and that many of its features have been implemented in Netscape, ensures that much of its content is a de facto standard already.

This last point is actually the source of a great deal of discontent in the Internet world. It is felt that Netscape Communications (authors of the Netscape browser) have run ahead of the process of standardisation and implemented features in an ad hoc manner. While many of us might be tempted to say that they are only implementing features that we all want to see in a browser, it should also be appreciated that one of the underpinning strengths of the WWW is its platform and vendor independence, and threatening this tenet is likely to upset a lot of people.

HTML 3.0 is described as being 'broadly backwards compatible' with version 2.0. Enough said on the history!

General features in HTML 3.0

In HTML 2.0, most tags relate to both presentation and content, for example `<I>...</I>` denotes italicisation while `<ADDRESS>...</ADDRESS>` indicates to the browser that the enclosed text is an address. One of the motivations behind the new tags in HTML 3.0 is that they should relate to the content of the bounded text, not the intended presentation. This choice of emphasis has only been made to reinforce one of the principles of the WWW, that the information served should be capable of being presented in a variety of environments which may not be capable of dealing accurately with presentation tags. This is particularly important when a browser must work with text terminals or even non-visual output devices such as speech processors. When a speech processor encounters an `ADDRESS` tag, it can preface the address with the words 'The address is as follows', but what should it do when it stumbles upon an italic tag?

Marking-up content is also important for applications which automatically process text, such as search engines that build databases of the titles of WWW documents or an - hypothetical - application that searches all Web documents in order to collect addresses. A list of the content tags, or *content elements* as they have now formally become known, is in Figure 1.

Internationalisation

There is a MIME type, `text/html`, associated with HTML documents. You may remember from my article about MIME (*EXE October '94*) that the `text` content type takes a `charset` parameter. By setting this parameter accordingly, the document text may be displayed with a wide variety of character sets. In practice, it will be the default character set that is used, which for the `text/html` content type/subtype is ISO-8859-1 if the text contains 8-bit characters, and straight US-ASCII otherwise. The ISO-8859-1 character set is also known as Latin-1 and contains the characters used by most Western European languages.

For 8-bit characters that are precluded, an alternative means of denoting these special characters has to be used. HTML 3.0 provides two mechanisms for doing this; first it includes tags called *entity references*

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such as <eacute>. These tags also provide a means of displaying characters from a character set other than the one being used. The other means is through *numeric character references*, whereby any character can be represented by its character set entry number with the syntax &#nnn;.

A	A hypermedia jump (anchor)
ABBREV	An abbreviation
ACRONYM	An acronym
ADDRESS	An address
AU	An author
BANNER	Information that should not scroll with the body text (i.e. always visible)
BODY	This marks the main body of text (i.e. not the HEAD)
BQ	An extended quotation (used to be BLOCKQUOTE)
CAPTION	Labels a figure or table
CITE	Specifies a citation
CODE	Indicates an example of code
CREDIT	Names the source of a block quotation or figure
DD	Defines a term in a term definition list
DEL	Marks deleted text
DFN	Indicates the defining instance of a term
DIR	A style of list (superseded by new features to the UL element)
DIV	To represent different kinds of containers, e.g. chapter or section
DL	A list of terms and corresponding definitions
DT	Specifies a term name in a term definition list
FN	Marks a footnote
FORM	Indicates that the page is a fill-in form
H	Marks one of six levels of header
HEAD	Marks the extent of certain header elements
HTML	Indicates that this document is HTML
INPUT	Marks a fill-in field in a form
INS	Denotes text that has been inserted
ISINDEX	Informs the HTML browser that the document is an index document
KBD	Indicates text typed in by the user
LANG	Alters the language context
LH	Marks a list's title
LI	Indicates a list item
MATH	To include math expressions
MENU	Another style of list (superseded by new features to the UL element)
META	To embed document meta-information not defined by other elements
NOTE	For admonishments such as notes or warnings
OL	Marks a numbered list of items
OPTION	Used in conjunction with SELECT to represent one of several user choices
PERSON	For names of people
Q	For a short quotation
RANGE	Marks a range of the document
SAMP	Indicates a sequence of literal characters
SELECT	For single and multiple choice menus
TABLE	Denotes a table
TD	Table data cell
TEXTAREA	Lets users enter more than one line of text
TH	Table header cell
TITLE	Identifies the document
TR	Marks a table row
UL	An unordered list
VAR	For a variable name

Figure 1 - A list of content markup elements

ABOVE	Draws an arrow, line or symbol above an expression
ARRAY	For matrices and other kinds of arrays
ATOP	Used when you want to place one thing above another, without the dividing line
BAR	Draws a line over the enclosed term
BELOW	To draw an arrow, line or symbol above an expression
BOX	For hidden brackets and placing one term over another
BT	Overrides the default rendering and indicates a bold, upright font
CHOOSE	Places one term over another, with a divider and enclosed in brackets
DDOT	Draws a double dot over the enclosed term
DOT	Draws a single dot over the enclosed term
HAT	Draws a circumflex over the enclosed term
ITEM	For data items within the ARRAY element
LEFT	Used with delimiters that are to be placed to the left of an enclosed term
RIGHT	Used with delimiters that are to be placed to the right of an enclosed term
ROOT	Specifies arbitrary roots of an expression, eg. cube root
ROW	Marks rows within the ARRAY element
SQRT	Indicates the square root of an expression
SUB	Marks a subscript
SUP	Marks a superscript
T	Overrides the default rendering and indicates an upright font
TEXT	To include a short piece of text within a math element
TILDE	Draws a tilde over the enclosed term
VEC	Draws a right arrow above the term

Figure 2 - A list of mathematics markup elements

Tag parameters

The practice in previous versions of HTML of specifying additional parameters to a tag, such as the `align` parameter in an `img` tag, has been both extended and made more regular. Most tags now take several parameters (also know as attributes), and many of these parameters are common to several tags. At this point in the article it is worth introducing some of the more common parameters.

The most common parameters for tags that can appear in the body of the document are ID, LANG and CLASS. The ID parameter allows the author to mark the point in the text with a unique name that can be used as a target for hypertext links. The LANG parameter specifies the language that the enclosed text is in, so generally it will be specified only once as a parameter of the BODY tag. For instance, to specify UK English, the parameter is `lang = en.uk`.

The last of these parameters, CLASS, is an important feature as it paves the way for a great degree of flexibility in marking-up content and presentation requirements. Simply put, it allows the author to subclass the tag to be more specific about the content type or to reference a class in an associated style sheet that specifies the desired presentation.

The ALIGN attribute performs much the same role as it used to do, i.e. specifying the horizontal alignment of an entity, but it has now been extended both in capability and in applicability. In general it takes one of the values `left`, `center` (sic), `right` or `justify`.

The parameter NOWRAP indicates that the browser should not be allowed to wrap text as and when the whim takes it, and hence control over wrapping is put back into the author's hands, who may use the BR tag when a line end is required.

The CLEAR attribute has become necessary because of the introduction of another HTML 3.0 feature, that of wrapping text around figures. CLEAR can be applied to any block structure, such as a paragraph, and specifies that the text should not wrap around the figure, but rather *clear* it, hence the name. It has a number of subtleties.

The SRC and MD attributes go hand-in-hand. SRC specifies the URL of an image that is to be included in the text. It can be used in a variety of situations, not just with the IMG tag (the most common situation). For instance, it can be included in a list to specify customised bullets. MD stands for Message Digest. It gives a signature for the image

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CIRCLE NO. 205

BASE	Gives the base URL for dereferencing relative URLs
FIG	An enhancement of the existing IMG element
LINK	Indicates a relationship between the document and some other object
OVERLAY	Is used to overlay images on top of a base figure
STYLE	Provides a means for including rendering information (see text)
TAB	Used when you want fine control over the horizontal positioning

Figure 3 - A list of notable miscellaneous markup elements

```
<TABLE BORDER>
   <CAPTION>A test table with merged cells</CAPTION>
   <TR><TH ROWSPAN=2><TH COLSPAN=2>Average
        <TH ROWSPAN=2>other<BR>category<TH>Misc
   <TR><TH>height<TH>weight
   <TR><TH ALIGN=LEFT>males<TD>1.9<TD>0.003
   <TR><TH ALIGN=LEFT ROWSPAN=2>females<TD>1.7<TD>0.002
</TABLE>
```

Figure 4 - A table in HTML 3.0

specified by SRC, so that it can be ensured that the original graphic image is loaded.

Tables

The ability for a WWW browser to display tables of information has been discussed for quite some time now. HTML 3.0 formalises the de facto standard for expressing tables, as already implemented in the various Netscape browsers. The tags used to support tables are found in Figure 1, among the other content type tags, the primary ones being TABLE, CAPTION, TR, TH and TD.

A point worth noting is that the size of a table is determined by a complex algorithm based on the cells' content and the current window size. The algorithm can be overridden by the COLSPEC attribute.

Tables can contain a wide range of content such as headers, lists, paragraphs, forms, figures, preformatted text and even nested tables. Figures 4 and 5 demonstrate the use of the table tags and shows off some of the fancier features.

The TABLE tag takes a BORDER parameter which specifies whether a border should be present or not. A borderless table is particularly suitable for layout purpose as well as for tabular data, for example to create a fill-out form in which the input fields and their descriptions are aligned one over the next.

Mathematical equations

The challenge for HTML developers in producing a specification for the markup of mathematical equations was to produce something that was simple, yet powerful and did not simply duplicate the work of existing specifications.

The list of 23 tags that have been proposed are listed in Figure 2 along with a brief description of their effect. Any mathematical expression is bounded by the MATH tag, within which any of the other tags can be used. The specification draws a lot on the math mode in LaTeX, so if you are familiar with that software, you are more that halfway there. One of the most powerful tags is BOX which is used when an expression needs to be bracketed but the brackets are not to appear in the presentation. The following example shows how to write mathematical expressions in HTML 3.0.

Expressed in English 'the integral from a to b of f(x) over 1+x' is specified in HTML by

```
<MATH>&int;_a_^b^{f(x)<over>1+x} dx</MATH>
```

and should appear in a browser like:

$$\int_a^b \frac{f(x)}{1+x}\,dx$$

Note that the standard abbreviations '_' and '^' represent respectively subscripts and superscripts.

Style Sheets

Style sheets seem to be a powerful concession to those authors who are primarily commercial publishers rather than simply information providers, in that they give a great degree of control over the finished look of the document. However, the provision of an accompanying style sheet allows the basic HTML text to be relatively free from the trappings of presentation, and instead be marked-up primarily on content.

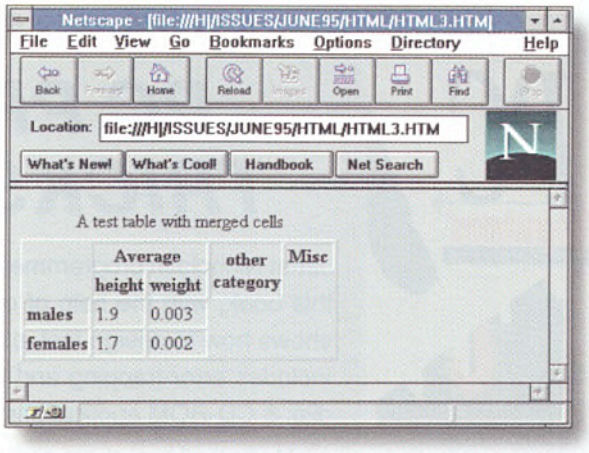

Figure 5 - The code in Figure 4 displayed with Netscape 1.1N

At present there is much work to be done before a viable reference implementation can be made available, but it is useful to explore the framework of the proposal.

Styles for presentation tags (e.g. headers H1 to H6) are drawn from a variety of places, namely the browser's configuration, a linked style sheet (specified by the LINK tag) and style information present in the STYLE tag contained in the document's header. The styles specified in the document header will override styles drawn from elsewhere, even the browser's defaults. They give the author control over some aspect of presentation that they feel strongly about.

As a final twist to this stylish tale, by using a block tag's STYLE parameter it is possible to associate a different style just for that instance of the block, e.g:

```
<h2 class=bigcaps>Header with bigger than
normal capitals</h2>
<p class=abstract>A paragraph with a
unique style of its own ....
```

Existing HTML 3.0 software

HTML 3.0 is still a draft specification. However if you wish to make use of HTML 3.0 software for either authoring or viewing, there are some programs around that will help. Two browsers are available, one from the commercial camp and the other from the field of research.

Arena is the official HTML 3.0 testbed browser being developed by the WWW Consortium. It has been made available to all in binary form, though only for a number of Unix platforms. It is an ongoing effort that is evolving as the specification stabilises, and at present provides the most comprehensive support for HTML 3.0 browsing. See the bibli-

ography for details of how to obtain Arena.

Netscape Communications has been forging ahead, implementing a mixture of HTML 3.0 and proprietary extensions. Of the HTML 3.0 features supported, the most significant is a fairly complete implementation of tables. Another HTML 3.0 feature supported is that of author specified backgrounds, allowing something other than the default grey.

However it's Netscape's proprietary extensions that have drawn the strongest response from the Internet community, with claims that Netscape is trying to capture the market for itself by introducing features which have not been agreed on by the IETF. In particular, one of the most radical additions is that of being able to *push* data to Netscape, thus introducing two new facets to the WWW, that of browsers that listen for connections and the concept of a session with an HTTP server. These extensions, while facilitating applications such as animation and information that is regularly updated, are controversial because they strike at the heart of the nature of the Web. They challenge such tenets as having a lightweight one-shot interaction with a server, and keeping bandwidth usage to a minimum.

Bibliography

Developer's mailing list	subscribe to the list *www-html* at the server *listserv@w3.org*
Developer's mailing list archives	http://www.acl.lanl.gov/HTML_WG/archives.html
HTML 3.0 Spec (HTML version)	http://www.hpl.hp.co.uk/people/dsr/html/CoverPage.html
HTML 3.0 Spec (ASCII Version)	http://www.ics.uci.edu/pub/ietf/html/draft-ietf-html-specv3-00.txt.gz
Arena Information	http://www.w3.org/hypertext/WWW/Arena/
Netscape Browsers	ftp://ftp.netscape.com

The commercial influence behind the introduction of such features is unmistakable as Netscape Communications strives to be the foremost provider of browsers to the world, and as they bow to the pressures of marketing executives who are not so much concerned with marking up the content of the material they publish, as being able to have precise control over how the information is presented to the viewer. With so much money being spent on corporate images and the need to be able to establish a visual identity, the last thing that on-line advertising agencies want is for the pages that they produce to share similarities with other companies' pages, or for the final look to be at the mercy of the viewers preferences.

Participating

As I came to terms with the new features in HTML 3.0 I couldn't help thinking that I was glad for the introduction of word processor add-ons, such as those from Microsoft and Quarterdeck, because to make use of the more advanced features it will be necessary to use tools that are more sophisticated than writing HTML in a text editor. The results, though, of using a more complex mark-up language will, I believe, be worthwhile.

If you want to get directly involved in evaluating HTML 3.0 then I suggest joining the mailing list mentioned in the bibliography: you are quite entitled to do so. The process is one that is open to any interested party. ■

Paul Richardson is a Director of Motiv Systems Ltd, a consultancy specialising in the Internet . He can be contacted on 01223 576318 or by email at paulr@motiv.demon.co.uk.

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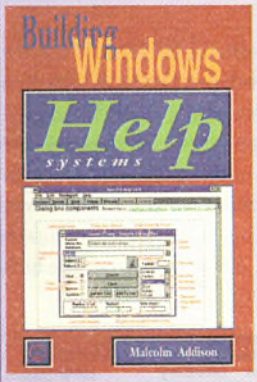

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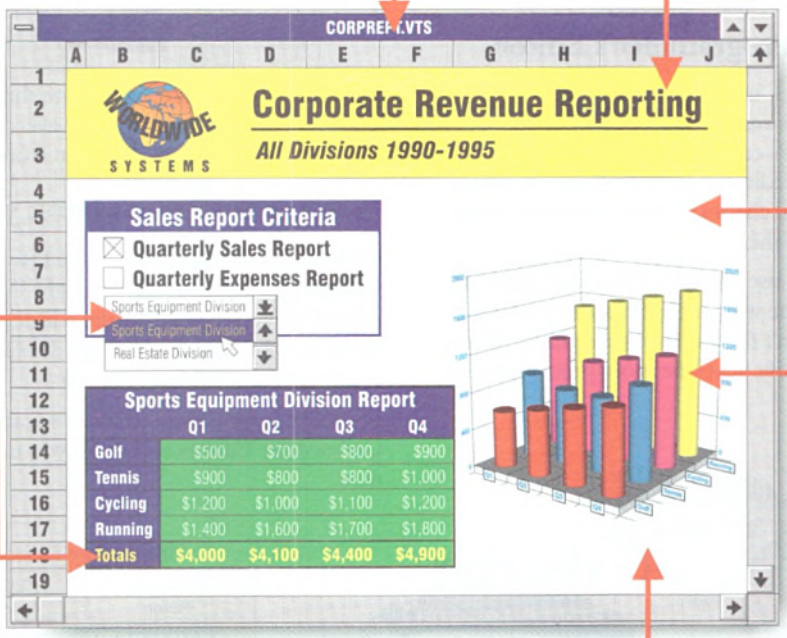

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All about processes... ...well nearly

The only certainties are birth, death and being a zombie... **Peter Collinson** takes us through the highlights of the life of the humble process, showing how it has changed as UNIX itself has evolved.

It seems to me to be time for one of those 'this is how it all hangs together' columns. I've chosen to talk about how processes live: what happens when you login, how signals are handled, the idea behind process groups and the new POSIX notion of sessions. Much of this is invisible, or at least appears to work in a way that doesn't reflect how things actually do operate. For example, shells apparently support background and foreground processes. In reality, there is little distinction as far as the kernel is concerned. The foreground/background idea is managed by some co-operation between the shell, the terminal driver in the kernel, and the process itself.

Like many aspects of UNIX, all of this has evolved with time. Many system calls that exist today are there because some new need that was identified causing changes to be made to the original design. Of course, history shapes current systems in a huge way. Each change has had to be done in an incremental way, so that old programs don't break. In addition, the POSIX committees have often taken on themselves to invent a new 'sensible' solution when the two main strands of UNIX have diverged. By now, systems are generally converging towards the POSIX way of doing things.

What is a process?

A process is a running program. The kernel sees a process as three distinct pieces: the binary code of program and its associated data area, the stack where volatile data is stored, and a control page called the `u-area`. The process itself uses a model which usually maps onto the architecture of the underlying machine. The application programmer, using a C compiler (or whatever), can usually act as though his program is running on the raw machine without OS interference. This point is emphasised by the fact that the kernel - a program that really *does* run on the raw machine - is usually a binary created using the same tools as an ordinary program.

The use of a direct mapping onto the machine is one of the reasons why UNIX source for simple programs port relatively easily into other operating systems. Of course, the program has to interact with the external world, perhaps reading or writing data, and this is done via system calls that trap into the kernel.

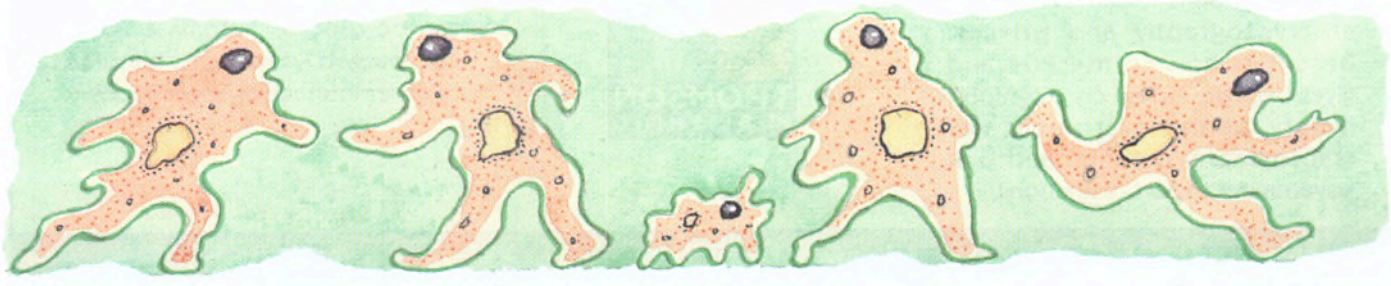
Processes have protected address spaces. They cannot write to the address space of any other process, nor can any other process trample on their address space. In fact, on most architectures these days, a process cannot write into its own program space. Processes can only interact with other processes and the outside world via system calls. Special system calls exist to allow one process to trace another for debugging purposes, and these work using a time-consuming handshake mechanism where the controlling process hands some magic data to the process being traced, and the traced process runs some glue code itself to do the work of setting things up for the controlling process. The point here is that processes can only deal with their own address spaces and need to run code themselves to change their own data.

A similar set of rules apply when a process is sent a *signal*. A signal is an external event that is sent to a process, often by typing a control key on the keyboard. The event may be interpreted in different ways by the process. The process can choose to trap it, or leave it to be handled by the default code in the system. The default code is part of the kernel, but is run by the process itself.

When a signal is sent to a process, the kernel posts it by setting a bit in the `u-area` of the process. Next time the process gets a turn at the CPU, it will jump into the signal handling code, decide what to do with the signal and continue or die depending on how things are set up.

A process is created using the `fork` system call. Its job is simply to clone an existing process. I suspect that this was done in the early systems because it was easy. To `fork`, all you did was to swap the whole process out to disk, but not free the space that it occupied. A new `u-area` was created by copying. The final tidying was to change the number of the process (the process id or `pid`) to a new one, fix a few reference counts and you were done. This was cheap operation because you could point the disk hardware at a section of memory and say 'copy that'. The swapping out happened with no intervention of the CPU.

The new process is the 'child' and the old one the 'parent'. There's one difference between the two processes: the `fork()` system call returns zero in the child, and returns the child's `pid` in the parent process. This allows us to run different code in each copy of the program. The child usually then calls the `exec` system call which will throw away all that carefully copied address space, pull in a new binary from a file and start running it. However, notice that this allows the new program to inherit the `u-area` contents of the original process.



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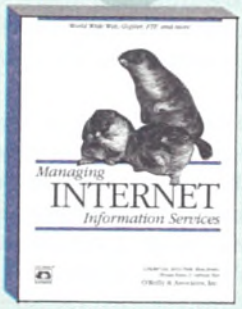

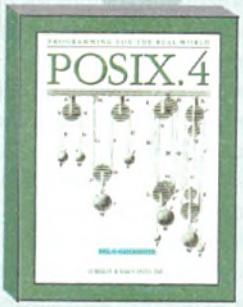

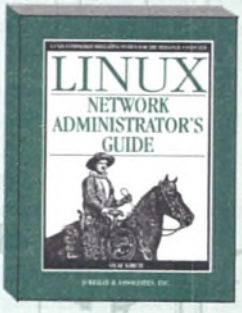

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CIRCLE NO. 192

When systems such as the VAX, that used paging rather than swapping came in, `fork/exec` became expensive, because it meant touching all the pages in a process to copy them. It was better to just create a new set of page tables for the child that pointed at the old ones. A first attempt at making things faster was the `vfork` system call, where the child ran using the same pages as the parent. This was aimed at the case where a `fork` was followed quickly by an `exec`. The `vfork` call was limited and dangerous: you needed to be careful what code you ran in the child before the `exec` system call was executed, otherwise you could adversely affect the operation of the parent.

The key solution was 'copy-on-write'. The child's page tables are copied from the parent, so two processes have a pointer to every page. If either tries to write to a page, then a copy of the page is made, so each process now has a different set of data. This solution took some years to develop, and in retrospect, it seems so simple that one wonders why it took so long. That's the trouble with many simple ideas.

The parent/child relationship between processes is important. The most common case is when a parent launches a child and waits for it to die before proceeding. The parent uses the `wait` system call to sleep until the child dies. When a child decides to die, it calls the `exit` system call and enters so-called 'Zombie' state. This state exists because the child has some statistical information that is passed back to the parent. The information is returned immediately to the parent if it's sitting and waiting. Otherwise, the zombie will persist until the parent calls `wait`, a process often known as reaping dead processes.

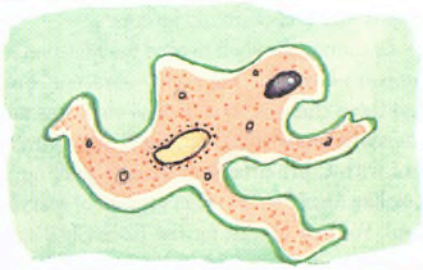
The question 'Why can't I kill a zombie?' is on most UNIX Frequently Asked Question lists. The point is that the process has actually died and has no code left to handle the signal. It's waiting for its parent to call `wait`. If this doesn't happen, then the zombie will hang around for ever. If you kill the parent, then the 'Rule of One' applies - all orphaned processes become the children of process 1 (usually called `init`). Process 1 will call `wait` fairly quickly and so the zombie will go away.

Getting things started

The fact that each process inherits some state from a previous ancestor leads onto the question of how things start. In System V this has changed somewhat from the original UNIX Research releases, while BSD derived systems have remained similar. Let's talk about where things started.

The first real process on the system is process 1. It's created by the kernel and runs a user-level program `init`. This program handles system bootstrap, runs the `/etc/rc` files through the shell and finally starts looking for terminals. The selection of terminals is controlled by a text file called `/etc/ttys`, and whose contents have altered over the years.

In the early systems, people mostly logged in on serial lines and it was important to set



the data transfer characteristics (speed and parity) before coherent conversation could take place. So `init` read the terminal characteristics from the file, `fork`ed once for each terminal, opened the terminal, and `exec`'ed to `getty`. The fact that 'Getty' is the name of a US petrol company with big signs all over New Jersey is not a coincidence.

The opening of the terminal here is important. Each UNIX process that talks to a user has a 'controlling terminal'. This is mostly used for signal management. When the user hits the interrupt key it is sent to all the processes who share that controlling terminal. (Actually, that's the way it used to be. This has now changed with the invention of job control, explained below.) The controlling terminal is also the way that the `/dev/tty` entry speaks to your terminal. The controlling terminal is established by the `open` routine in the terminal driver. If the space in the relevant structure is empty, then a pointer to the terminal is added. So the controlling terminal is the first piece of system state that the user process picks up.

The job of `getty` is simple. It adapts to the speed of the terminal and accepts your login name. This is mostly defunct now, because modems will do speed adaptation for you. Once `getty` has an intelligible string, it `exec`s to the `login` program. The `login` program validates the user, sets up various strings in the environment (like USER and HOME) and `exec` to the user's chosen shell. The program will also ensure that file descriptors 0, 1 and 2 are established to point at the current terminal ready for the shell to use as the standard input, standard output and standard error channels.

There's a little bit of magic when the shell is `exec`'ed. The shell is loaded with its 'zeroth' argument (the command name) set to begin with a minus character. This is impossible to do from a normal command line. Shells use the minus character as cue to take special action for users at login time. The shell now takes over. It probably runs a setup script and hands the user a prompt which says: 'OK you can go ahead'.

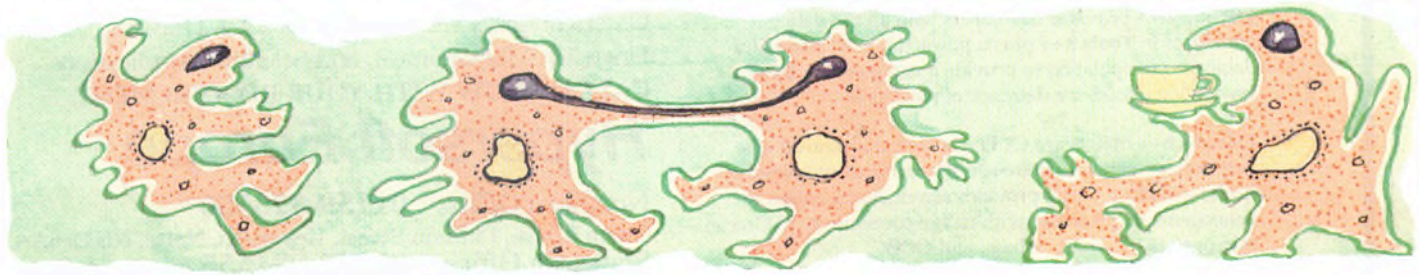
There are some things to notice about this. The only `fork` that is involved is the initial one that started `init` listening on the terminal. The shell starts using the same process id as the original `init` clone. When the user exits from the shell, `init` knows that the line needs resetting because its `wait` system will return with a `pid` that it originally created.

As I said, this is the basic pattern sequence still in use today in BSD-derived systems. System V changed this for all terminals other than the console, using `ttymon` rather than `getty`. It's the `ttymon` program rather than `init` that is responsible for handling terminal lines. In effect part of the original `init` process has been moved into a separate process.

Process groups

The early systems had no notion of a login session - you could run the `login` program at any time to become a new user. There was also no real idea of background and foreground processes. When you started something in the background using the `&` syntax, then its controlling terminal was still your console. The background process could write to the console at any time. Worse, it could read from the console and you could end up typing lines of text into two different programs from the same keyboard.

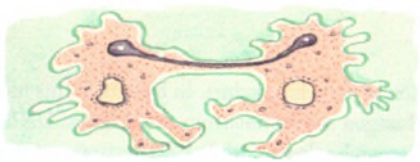
A process started with `&` ignored the Interrupt and Quit signals that were sent by your keyboard, so at least it didn't terminate if you interrupted some program that you had started without an ampersand. However, if



your line dropped, all the processes were sent a Hangup (HUP) signal and this would kill background processes. This could be inconvenient and gave rise to a command (`nohup`) whose job was to ensure that a background process was not killed when you logged out.

The next step was the creation of *process groups* to help with the dispatch of signals from the terminal to all the processes that needed to get them. When an invocation of `init` opens the terminal for the first time, the process id is recorded as the process group id in the process's `u_area` and is inherited by all descendants of the original process. The terminal driver also records the process group id in its data structure. When the driver wants to send a signal to the process group, it uses this stored number to search through all the processes on the system looking for processes that are in the relevant process group.

Jim Kulp of IIASA in Austria used this to good effect with the creation of job control. When the shell launches a command or a command pipeline as a 'job' in the background, he arranged for this job to have a different process group from that recorded in the terminal data structure, so processes in the job do not get the signal. Moving a job from the background to the foreground is simply a matter of changing the stored process id in the terminal data structure.



Two other bits of glue are needed in the terminal device driver to make job control work nicely. First, if a process attempts to *read* from the terminal but that process is not in the same process group as the terminal, then the process is put to sleep. The user can now arrange which job takes terminal input. Second, if a process attempts to *write* to the terminal, and is not in the same process group as the terminal, it can also be put to sleep. This was made to be optional and controllable by an `stty` option, because mostly people don't mind some output from a background process.

Of course, the shell needed modification to support job control. For many years, only `csh` had these changes. The Bourne shell was not altered (it was written in C, but C heavily overlaid with C pre-processor macros making it look like Algol 68 - the effect was one of encryption). We had to wait for the Korn Shell and latterly `bash` to provide full job control in a shell with Bourne shell syntax. However, only the shell requires modification: no other user processes are affected by job control. This was a great plus.

In fact, putting the process to sleep was implemented by a signal sent to a background job so that the whole job was stopped. Two signals were needed. SIGTTOU is sent when a background job attempts to write to the terminal; SIGTTIN is sent when a background job attempts to read from the terminal. Some mechanism was also needed to allow the user to suspend temporarily a job started in the foreground and then communicate with the shell to perhaps put the job into the background. A new signal was added to the terminal driver, SIGTSTP, usually emitted by Control-Z. It is sent to the job that is in the foreground on the terminal.

Since most jobs take no special action with the SIGTSTP signal, the default action is followed. The process is put to sleep and the SIGCHLD signal is sent to the parent of the process. This is usually the user's shell. With `csh` the user gets some interaction like:

```
% cc -O hello.c
^Z
Stopped
%
```

The word 'Stopped' here is confusing, especially to VMS users who think that the job has been killed. But the process hasn't stopped for ever, it has merely been suspended. It would be better if `csh` printed 'Suspended'.

When the shell gets the SIGCHLD signal,

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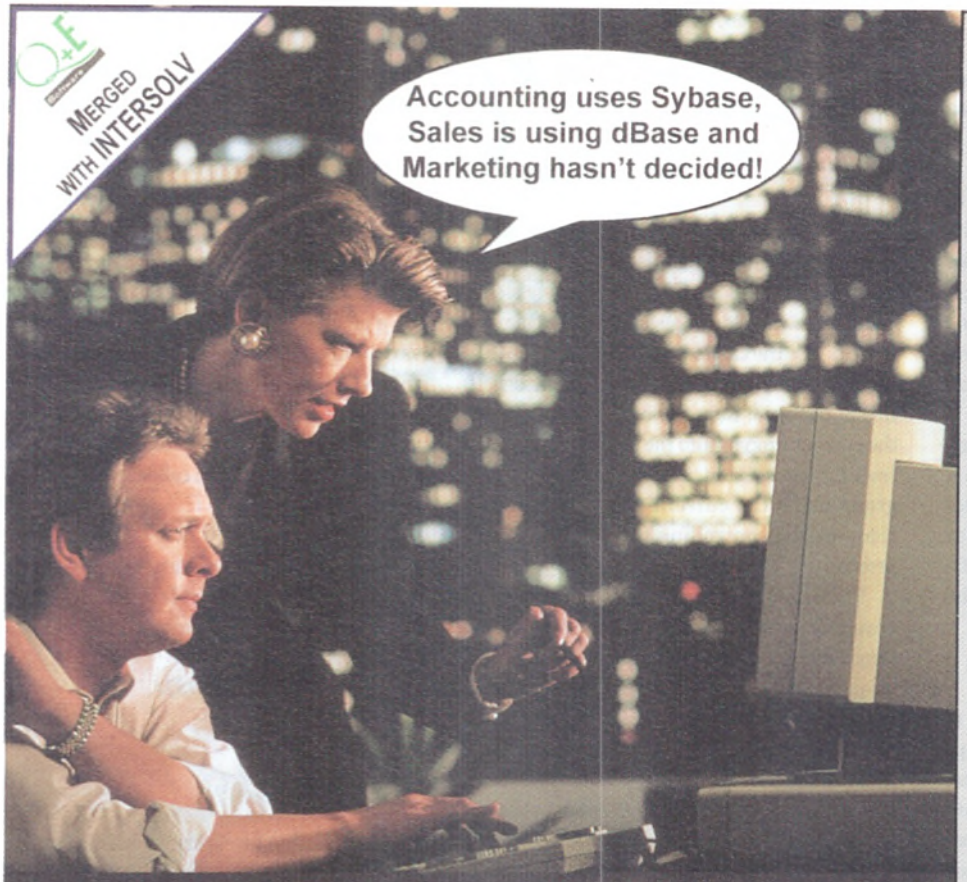

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it notices that the job has been suspended, fiddles with the process group on the terminal so that it controls it, prints 'Stopped' and a prompt.

The user can now type a `bg` command to run the job in the background. This causes the shell to send a SIGCONT signal to the process group of the backgrounded job making it run again. The `fg` command does exactly the same thing, except that the shell will set the stored process group on the terminal to that of the `cc` command.

The use of signals for all these functions may seem to be overkill. They do provide a mechanism for processes to notice and deal with various start and stop situations. For example, visual editors like to catch the SIGCONT signal so that they can re-draw the screen when they are restarted.

Sessions

POSIX wanted to find some portable way to bridge between the way that process groups are used on different systems. We have seen that systems with job control manipulate process groups for a user to provide the job control facility. If you login to a system with no job control, then all your processes that you launch will be in a single process group. As usual, the POSIX committee sought some compromise and created the notion of a *session*.

A session is a collection of one or more process groups. A session is started by a new system call `setsid`. This provides a clean break from the old process group and the old session. For the call to be effective, the process calling it must not be a process group leader. If this is the case, then the `setsid` call makes the current process into the *session leader* controlling the session, creates a new process group using the current process id, and it removes the controlling terminal from the process.

POSIX doesn't define a portable way of acquiring a new controlling terminal. BSD systems have an `ioctl` call to achieve this, but I suspect other systems may need to close all references to the terminal and re-open it to set the controlling terminal.

What use is `setsid`? Well, there are several occasions where you might wish to start a new session. Consider an editor like Emacs. An Emacs user can open a window and start a shell running in it. The user has editor control over the data typed into that window. On a BSD system, the shell will be talking to a pseudo-terminal (I talked about pseudo-terminals in February's *EXE*) that should be its controlling terminal. The editor will be talking to the master end of the pseudo-terminal.

Before sessions existed, setting this structure up correctly was very non-portable across systems, because the parent of the shell running in the window was the editor. Now it's only necessary to `fork` and call `setsid` to create a new free-standing session. As long as the various opens are done in the correct order, the child shell is presented with controlling terminal and process group behaviour that is indistinguishable from the situation that would have occured had it been called by `init` to talk to a regular terminal.

Peter Collinson is a freelance consultant specialising in UNIX. He can be reached electronically as pc@hillside.co.uk, by WWW on http://www.hillside.co.uk, or by phone on 01227 761824.

Further reading

You cannot go far wrong in looking at the excellent *Advanced Programming in the UNIX Environment* by W. Richard Stevens. This was published by Addison-Wesley in 1992 and is ISBN 0-201-56317-7.

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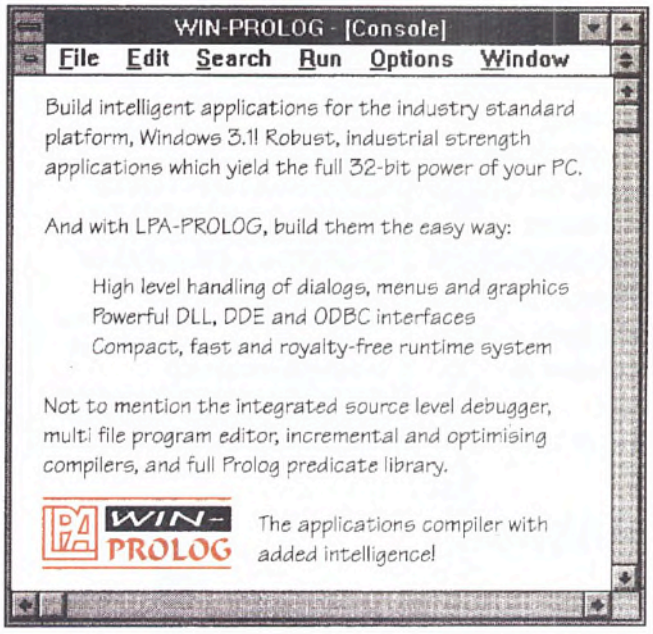

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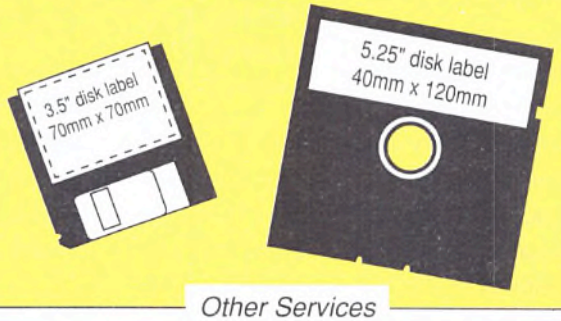

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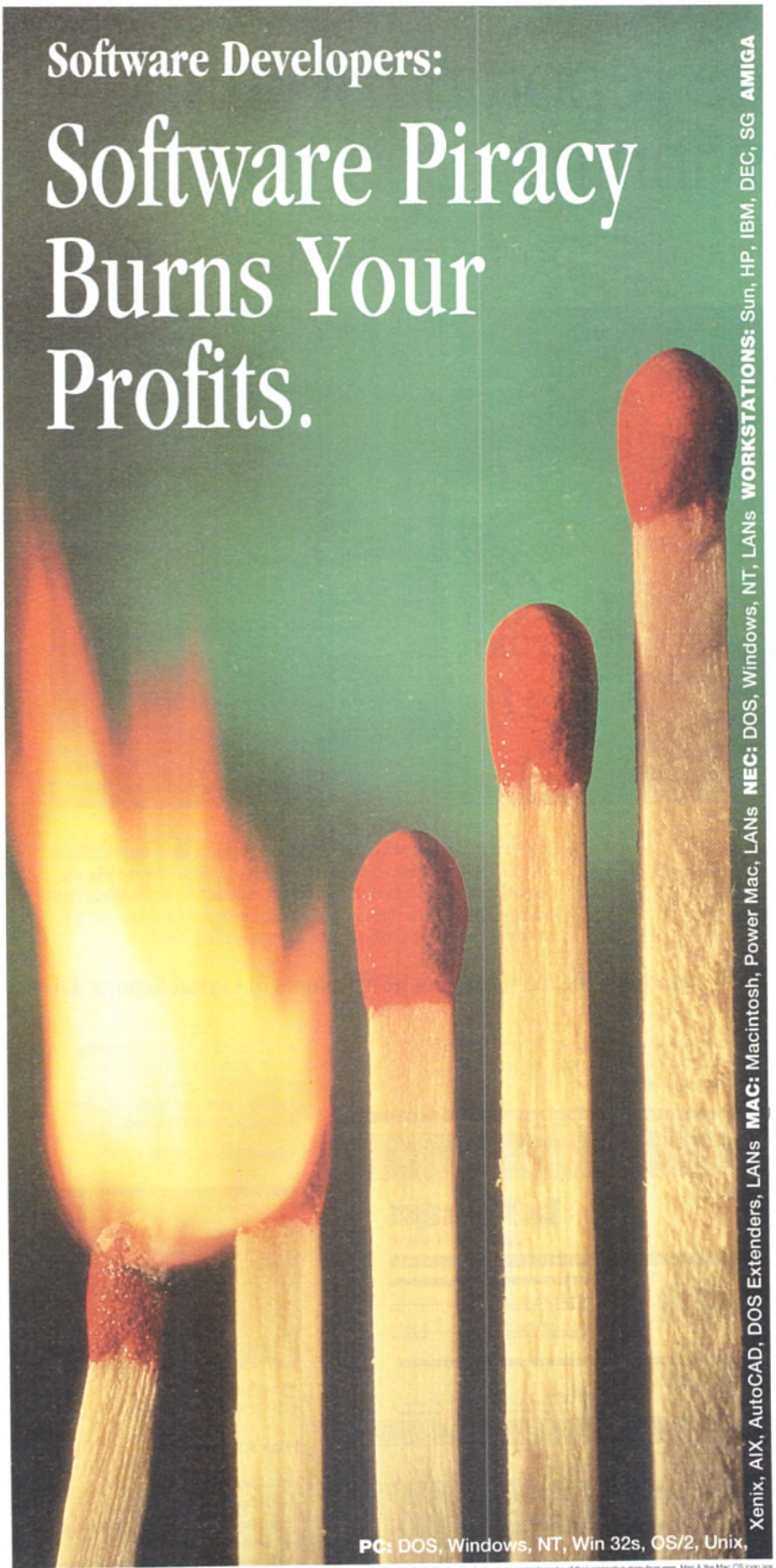

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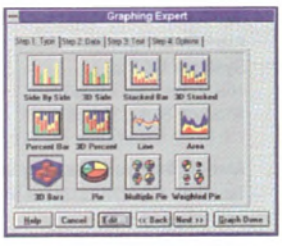

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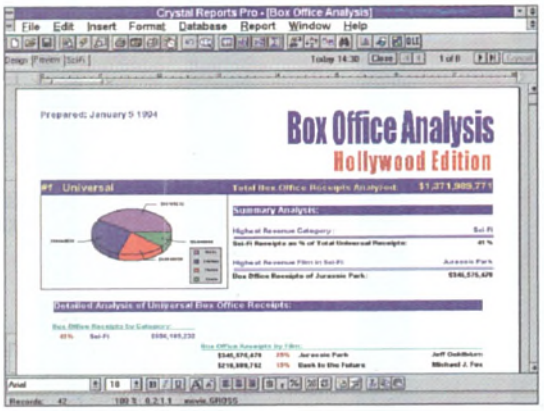

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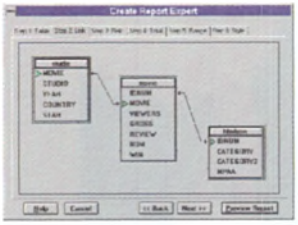

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CIRCLE NO. 215

It's time to write of many things

After limiting himself to only one subject, this month **Francis Glassborow** decides to cover multiple topics in his article. Most of them deal with C issues.

Over the years this column has grown like Topsy. Originally it was a half page to complement the half page that Mike Banahan was writing on behalf of ECUG. After a year Mike found that he lacked the time to do justice to his column so I absorbed his space. A little latter Will Watts moved on to another job and in the resulting hiatus I managed to grab another page. Cliff Saran as editor said he wanted single-topic articles. Not every topic justified the space but it takes little skill to pad text if necessary.

Now Will Watts is back pro tem. He is the kind of editor that likes to be in control and mould the work of contributors. I think that is an important editorial job so I welcome his input.

His first suggestion was that I take this back to being a column rather than a series of articles, but one with enough space to tackle several items each month. Both of us would welcome your feedback on this change. Immediate, specific response from readers is more useful than just reacting at renewal time.

Progress with C++ standardisation

As a result of the recent ISO round of voting, the Working Paper (WP) has become a Committee Draft (CD). In accordance with the ANSI X3J16 rules this goes out for public review, from mid-May till July 28.

A number of other countries are also carrying out formal or informal public reviews between early May and mid-July when there will be a formal vote on moving the CD forward to becoming a Draft International Standard (DIS). This level of vote is from National Bodies (NBs) based on the recommendation of their specialist committees. The UK's NB is the BSI and the relevant committee is IST5 guided by the C++ panel. Both the Netherlands and France voted against submitting the WP for registration as a CD. Presumably they will also vote against it becoming a DIS. My best guess is that there will be several other NBs voting 'no' and I will be surprised if the UK isn't among them. Some of you may be happy that the standardisation process seems to be so far along, others may be concerned. Either way, I don't think you should hold your breath as I think that we are in for quite a few rounds of voting before we have an International Standard (IS).

In my view, the newer aspects of the language (templates, exception handling and namespaces) need more attention than just polishing and editorial fixes. These are all that is allowed after a nascent standard moves from a CD to a DIS.

The Standard C++ Library

There is also the question of the position of the *Standard C++ Library* in the eventual C++ Standard. At root, a standard library isn't a library in the normal sense. In C++'s case it is three things at once: support for the kernel language (such as provision for the operator `new()`), items that would benefit from direct language support (such things as complex numbers are candidates) and those items that support portable code by defining universal public and protected interfaces. Only the first of these is essential to C++ as a language. The others are excellent candidates for an international standard but not necessarily as part of the language. Those who want everything in one package should face the consequences - late delivery of a buggy product. We've all been down that route in our work as programmers.

C problems

My postbag and experiences with training in C++ show that there are many capable C programmers who know less about the language than they think they do. That is a dangerous state to be in - ignorance of your ignorance can be fatal. Test yourself on the following code snippets:

```
int fn (struct X* x);
struct X { int i; } ex;
main (){
   fn (&ex);
   return 0;
}
```

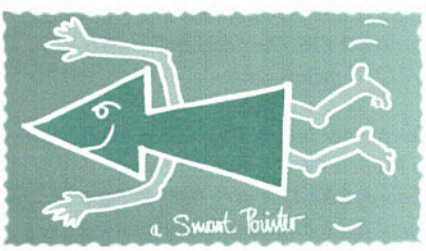
And
in FILE1:

```
char buffer [200];
```

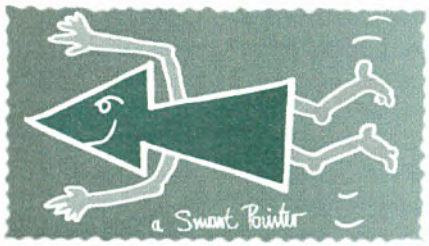
in FILE2:

```
extern char * buffer;
void init (){
   int i=0;
   for(i=0; i<200; i++)
buffer [i]= '\0';
}
```

The experts among you will quickly dismiss the two problems as trivial. For the rest, the first should not compile - if it does your



compiler is flawed. The second must compile and link but produces undefined behaviour. Don't even try it unless you are willing to restart your machine (or you are using a protected memory operating system such as Windows NT). I'll put the answers at the end so as to give you some time to think about them.



Smart pointers

Now, some programming meat. I will try to include some in each of my future columns. The subject of smart pointers is one that I am likely to return to because it is an important C++ idiom with special language support. This time out, I will keep to the fundamentals.

There are two special operators that handle dereferencing: '*' and '->'. The first of these is clearly a unary operator in this context, but what surprises many programmers is the discovery that the second is also treated as a unary operator. There are further surprises as well, but they are all necessary if the family of *smart pointer* idioms is to work. Consider:

```
ptrT -> something();
```

The compiler checks in the scope of the `ptrT` type for a definition of `operator->()`. If it finds one it looks at the return type. If this is a basic pointer to type (i.e. it evaluates to an address of an object), the compiler selects the member `something()` from that object (or returns a compile-time error if no such member exists). If it isn't a basic pointer, the compiler looks in the class of the new type for an `operator->()`. It applies this recursively until either the search fails or a basic pointer is found. Now:

```
class MyType;
//predeclares a class
class ptrMyType {
   MyType* mt;
public:
   ptrMyType() : mt(0) { }
// default to null pointer
   ptrMyType(MyType* m) : mt(m) { }
   operator MyType* { return mt; }
   MyType * operator -> () { return mt; }
};
```

Now I can write:

```
ptrMyType anmt (new MyType);
anmt -> something();
```

I will need to do something about handling the potential memory leak that such code can generate but that is a step too far for this column.

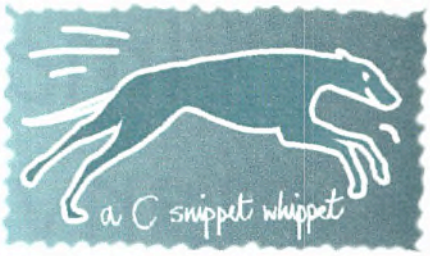
The above class specification needs much more work before you can reuse it as a template class. For finished code we must consider such details as copy construction and assignment. However it does contain the core of the most basic of smart pointers. I leave you to consider if the type conversion operator `MyType*()` should be qualified as `explicit` in future (when that keyword is implemented by your compiler). Instead I want to focus on a major consequence of taking control of dereferencing pointers. We have encapsulated the functionality and so control it. Consider the problem of the null pointer. We can now provide debug versions of `ptrMyType` which detect null pointers and take whatever action we deem appropriate. In the simplest case we can have:

```
operator MyType*() {
  if (0==this) abort();
  return mt;
}
MyType *operator ->();
   if (0==this) abort();
   return mt;
   }
```

Of course these examples are too simple but it is the basic idea that matters. Just as we use access functions to retain control of our data we can use smart pointer classes to keep control of dereferencing.

A book

If the subject of smart pointers is new to you ,or you can handle the rudiments but want to go further, I recommend that you put *Secrets of the C++ Masters* by Jeff Alger (ISBN 0 12 049940 1) on your reading list. Be careful because the title looks like one from a SAM series but the book is an *Academic Press Professional* publication. Despite the title and garish cover it is an excellent read. The author is occasionally flippant, in one place he's gratuitously rude about those serving on X3J16 without even adding that he was only joking (perhaps he wasn't). Such items should have been pulled by the technical reviewers.



Those C problems

The first snippet is very specifically a C problem because of C's special scope: the prototype scope. The `struct X` is first declared in the prototype scope of `fn()` and so has no validity outside that scope. So the subsequent definition of `struct X` is a new item unrelated to the previous one and, not as you might have thought, a completion of an incomplete declaration. Nit-picking? Yes, but if your compiler implementor cannot get such details right, where else have they got it wrong?

About the second snippet. In a value based language such as C, too many talk about the type of a value as well as the type of a variable. Addresses - the values stored in pointer variables - get talked about as pointers. This dooms successive generations of programmers to fall into this tarpit. The name of an array is not a pointer variable, it evaluates to an address (pointer *value*). As long as the compiler can see the context it will get it right, or report an error. But in this code, all the compiler can see in FILE2 is what you have written - you say that `buffer` is a variable for storing `char` addresses. It will compile code to extract the address of a `char` from the address that the linker will provide. This address is not the

```
extern char buffer[];
```

address of a pointer to `char` variable but the address of a `char`. FILE2 must declare:
Then the compiler can generate the correct assembler to evaluate the addresses of the elements of `buffer[]`.

If you do not understand this you have yet to complete your C apprenticeship.

■

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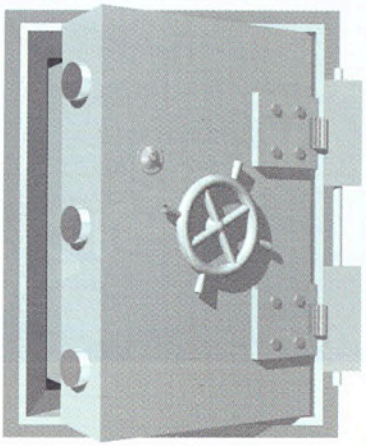

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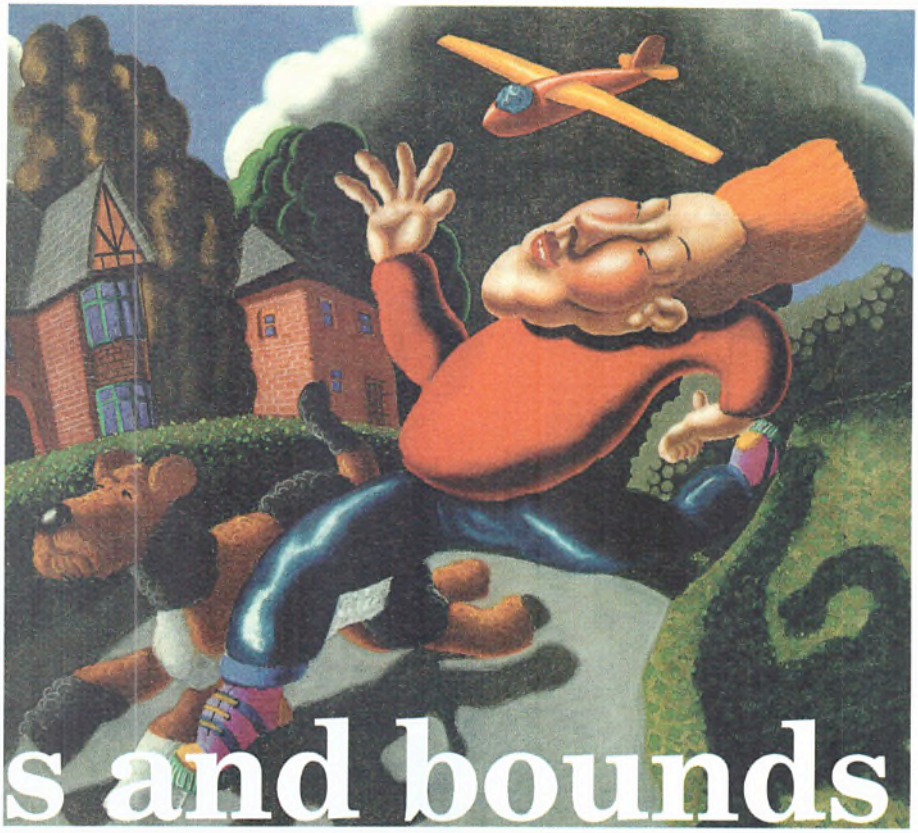
Developing in Windows, there's no salvation without a debugger. Colin Smith takes the Bounds Checker penguin on a bug hunt.



In leaps and bounds

Debugging is an art shrouded in mystery. There are no hard and fast rules, only techniques. I knew one programmer who coded in assembler (for DOS may I add) but refused to use a debugger of any kind. Instead he resorted to the use of strategically placed 'beeps' (with key presses) which allowed him to listen to his programs! The code he produced was as stable as anyone else's. As long as the technique enables you to find the bugs in a reasonable amount of time, it's a valid one. Once you enter the world of Windows, it isn't long before you have to head for the sanctuary of a debugger.

With the claim that all professional programmers will be redundant in the next century (*EXE December '94 - Soapbox*) because users will be doing their own applications, bugs may just be one of the things that keep us all in a job. Bug hunting is the most frustrating part of programming, and often the thing that puts DIY people off - thankfully! If we can get rid of bugs better than the DIY end-user, then maybe there will be some hope for us, plus it will stop them complaining that *commercial* apps are bug-ridden.

Pick up a penguin

Bounds Checker for Windows is hailed as the debugging tool that you cannot or should not do without. It actually consists of several tools rolled into one:

- a heap checker,
- a debug kernel (so no need to use N2D.BAT to switch to the debug kernel),
- a message and event logging utility (spy),
- an API debugger (checks API parameters and return values),
- a post-mortem tool (for GPFs).

At the end of the day these tools are meant to find obscure bugs (the most frustrating) that most ordinary debuggers are incapable of finding. Just some of the things Bounds Checker can detect are: invalid memory accesses (e.g. through NULL pointers), heap and data corruption, memory and resource leakage, hardware faults and API parameter errors.

To be able to perform all these magical tasks, Bounds Checker takes control via a 200K VxD - sorry Warp people. As the checking Bounds Checker performs is very Windows version specific, it comes in four Windows varieties: Win32s, Windows NT, Windows 3.1, and Windows 95 (pre-release).

When an *error* is detected (or you purposely suspend the program), Bounds Checker pops up and lets you examine a variety of information, through its MDI interface - see Figure 1.

Duty bound

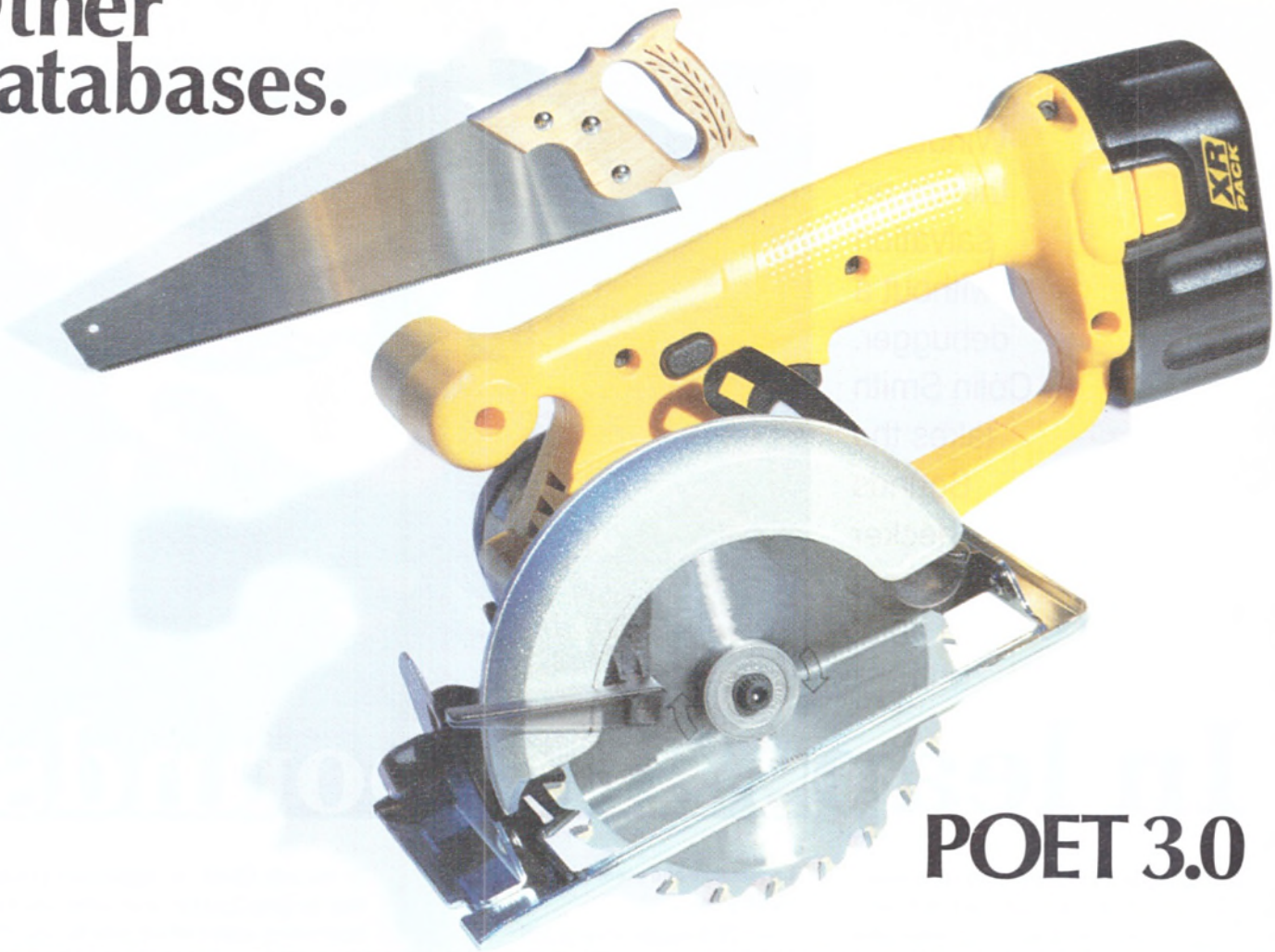
Bounds Checker requires no changes to the source code, and no linking of code or macros into the executable - all you have to do is compile with debug information. If you haven't got the application's source code, or if your 'natural language' is assembler then you can miss this step.

To 'Bounds Check' an application you first load Bounds Checker, then select the Load Application option which asks for the .EXE you wish to debug. Bounds Checker then tries to work out which DLLs and VBXs (by scanning the .EXE's resources) that this application will want to use, i.e. the implicitly loaded DLLs, and presents them in a list. If your application dynamically loads DLLs, i.e. via a `LoadLibrary` call, then you get the opportunity to add them to the list, so that their symbol information will get loaded as well. Bounds Checker then loads the application's symbol information for the .EXE and .DLLs (if they have any) and begins execution of the application.

There is also an External Load feature that lets you tell Bounds Checker to activate itself when a particular .EXE file is about to be executed. You have to use this option if the application you want to be tested is started by another program which you do not want to check, because you can only 'Bounds Check' one application at a time.

When the application is terminated, a .LOG report gets created. This report contains information on how much stack was used, the total amount of local and global memory that was allocated, as well as a record of the API failures etc. that occurred, and possible memory leaks. So, no longer do you have to guess how big to make your application's stack - Bounds Checker helps you to make a more informed decision as to what to set the `STACKSIZE` statement in your .DEF file.

Other Databases.



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Tally ho

A good brush won't make you any better at painting unless you know how to use it properly. This equally applies to debugging tools. So it's pleasing to see that Nu-Mega has taken the trouble to provide a practical tutorial that introduces the basic concepts of the Bounds Checker tool.

There is quite a large performance hit if you have all the default options on. So one of the first things you should do is disable all the options, and then go away and think carefully about which options should be turned on. This will save you a lot of time and disk space (see below).

Bounds Checker recognises API calls from the following modules: COMMDLG, GDI, KERNEL, KEYBOARD, OLECLI, OLESVR, SHELL, TOOLHELP, USER and VER. From this set you can configure which API calls **not** to log or validate, and thus stop Bounds Checker popping up on API calls that you know are ok, or that don't tell you anything. If you use other APIs e.g. WING, WINSOCK etc. then you are stumped, because there is no way to extend the list.

Bounds Checker (optionally) treats an error returned from an API call as a prospective error; e.g. the value of `HFILE_ERROR` returned by an `OpenFile` call is considered an error. The premise is that you may have forgotten to handle these error conditions, so it treats it as an error as an extra safety precaution - it can't tell whether you were clever enough to put in the code to handle these exceptions! To prevent this behaviour, you can turn off the option to check API return values, or less drastically tell Bounds Checker to ignore the check on that line if it gets to it again, and continue onto the next line.

The API parameter/return value checking feature relies on the dodgy API calls being made in the first place. If your testing procedures do not exhaustively test every part of your code, then Bounds Checker never gets a chance to perform its checks on them - so bugs could easily still slip through the net.

Version 2.2 of Bounds Checker now supports debugging for Visual Basic Custom Controls (VBXs). If you have already taken the carrot (or stick) of moving to OCXs then this will only be useful if you have to maintain some legacy applications. However, VBXs may be given a new lease of life by Borland's Delphi.

One area that may cause a little inconvenience is the configuration scheme adopted. You can't set up the options on the basis of each .EXE that you intend to 'Bounds Check' - they apply globally. Most options are in a single .INI file, while the list of APIs *not* to parameter check is in another file. So if you have to regularly Bounds Check different .EXEs with different options, you could quickly get in a muddle.

Bounds Checker can have an important role to play during the alpha and beta stages of a development, when dedicated testers finally get the opportunity to wreak havoc on the application

I spy

One of the most comprehensive parts of Bounds Checker is its ability to log a wide range of events. These include:

- API calls (including symbolic parameters i.e. with reference to your program's symbols)
- API return values
- Toolhelp/Kernel notifications
- Windows messages
- Hook callbacks
- Visual Basic API calls
- Visual Basic API return values
- Visual Basic CTL messages

When the program you are debugging is suspended (e.g. because Bounds Checker caught a potential error, or you suspended the application on purpose), the last 1024 events that have occurred are listed in the MDI 'Event' window. For a longer history of events you have to resort to recording the events to a .TRC trace file; for viewing by the separate TView program. If you log all events then your .TRC file gets huge quite quickly, your application can run painfully slowly as a result, and you have loads of events to manage in the .TRC file. To help with performance there is an option to cache the events that are written to the trace file. This causes a slight problem if you want to load up the .TRC file via the TView program (while the program is suspended) for more detail. The last few events won't be there, because they're still in the cache!

There are two opportunities to manage events. You can choose whether the event

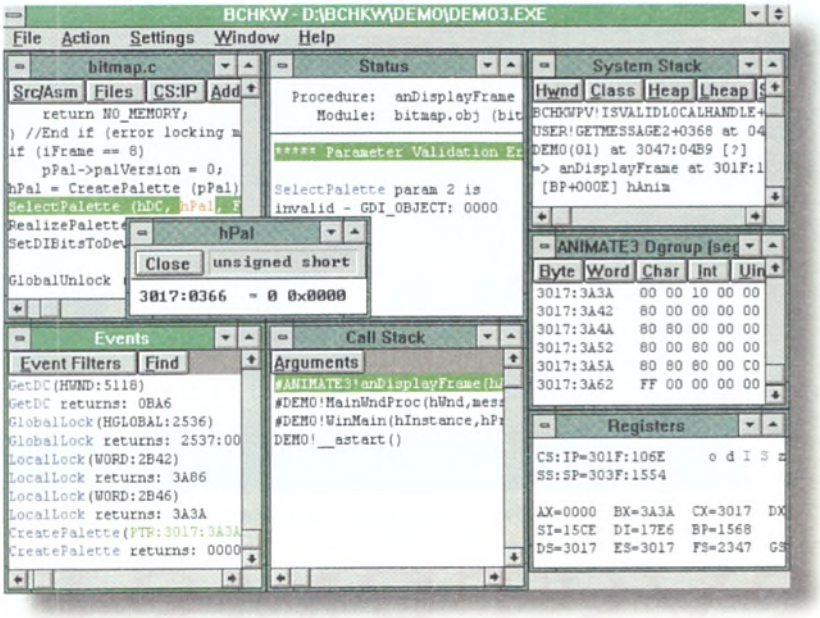

Figure 1 - Bounds Checker, bounds checking

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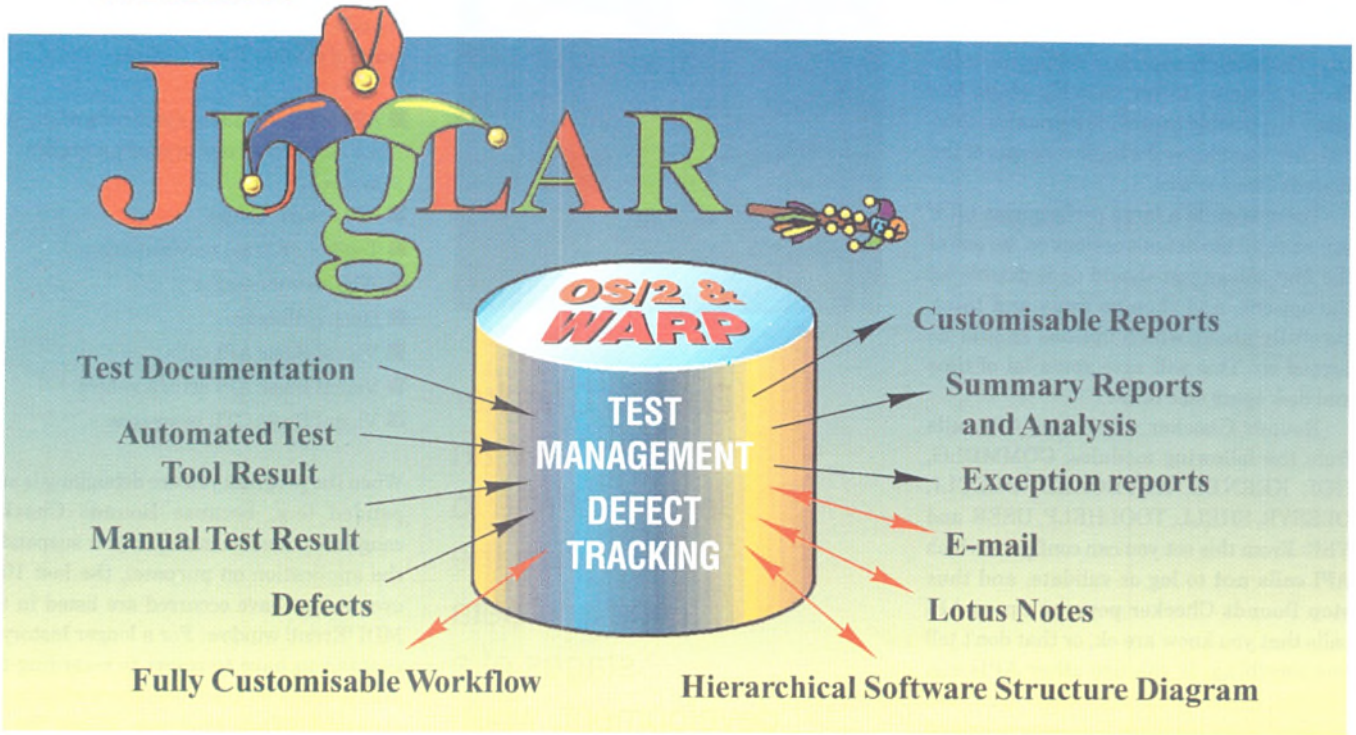

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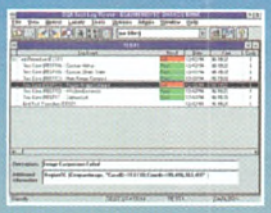

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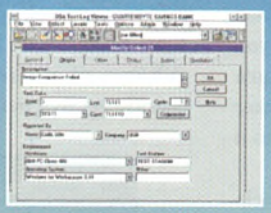

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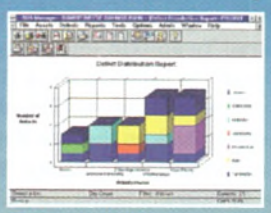

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is logged when it occurs, or you can log every event and then use the TView application to filter out the events that you are not interested in.

I want my debugger back!

When using Bounds Checker, it's quite natural to want to use a traditional symbolic debugger alongside it. The implication in the manual is that to be able to debug a program when Bounds Checker is in operation, you need to use Nu-Mega's Soft-ICE for Windows. This is further emphasised by the 'special' menu option which invokes Soft-ICE for Windows.

However, there is a way to use the CodeView debugger in tandem with Bounds Checker. This fiddle relies entirely on the External Load feature, and is certainly not the way this option was originally intended to be used. You load Bounds Checker, tell it the name of your .EXE via the External Load option, and then Bounds Checker merrily waits until it begins execution. Now you can fire up CodeView, pick your .EXE, set some breakpoints, and then off you go.

The situation is very different if you use the debugger built into the Microsoft Visual C++ IDE. Any breakpoints you set before launching the .EXE are just skipped past as if they weren't there. The breakpoints only take effect if they were set after the program started execution. I think this is a case of 'The Battle of the Debuggers'.

How it works

Bounds Checker uses several techniques to find your bugs. One involves writing a specific bit pattern after each block of allocated

Once you enter the world of Windows, it isn't long before you have to head for the sanctuary of a debugger

memory. It then periodically checks to see if the pattern has been altered, indicating that some code has written beyond the end of that heap block. This won't take you to the exact line of code that caused the corruption, but it will be pretty near.

One of the things Bounds Checker does is to set hundreds of breakpoints, at points in the code where there are Windows API calls. This enables it to *check* if the API arguments are correct before the call is made to Windows, and check the return mode value. If you look at the System Stack window of Figure 1, you can see that the function `ISVALIDLOCALHANDLE` was called by the module `BCHKWPV` (the parameter checking module of Bounds Checker) and this determined that the `hPal` parameter to `SelectPalette` was invalid.

Whenever there is an error caused by a piece of code, Bounds Checker walks back through the stack to look for a function for which it has source e.g. if a GPF was caused when `fmemcpy` was called, then you are taken to the line where `fmemcpy` was called, and not to the actual assembler instruction in `fmemcpy` that caused the exception.

Another technique is used to track your GDI/USER resources. Bounds Checker is aware of Windows API pairings, e.g. `LoadBitmap`, `DeleteObject`, so it maintains a table of handles, and watches for the handle to be deallocated e.g. a call to `DeleteObject` with the handle as a parameter. There are some situations in Windows when handles may get freed by a different route, so this check may incorrectly report an error.

A view to a bug

TView is a separate utility that allows you to view the trace files created by Bounds Checker. It has various view filtering options for different classes of events e.g. filter out API calls, API return values, hook calls, etc. that make the task of finding events that are of interest as simple as possible. If you have most of Bounds Checker's event options enabled then the .TRC file can easily grow to 20 MB in size. When your .TRC file gets into the megabyte region TView can sometimes be painfully slow at scrolling through it - which can't be helped I suppose due to the sheer amount of information recorded. Intelligent use of Bounds Checker's logging filters will help to avoid this situation. As the .TRC file produced by Bounds Checker is a binary file, you are reliant on TView to view it. There is an export option that allows you to save the events to an ASCII file. However, the export option does not maintain a hierarchical (tree-like) view of the events, plus you lose the ability to examine calls' parameters, e.g. which string was passed.

The filtering options include one called 'Noise Reduction'. When enabled, this option removes the API calls to `GetMessage`, `TranslateAccelerator`, `TranslateMessage`, and `DispatchMessage`, default Window procedures (e.g. `DefWindowProc`), and other usually non-significant events. This is a handy way to make the captured events much more readable. However, TView has a tendency to crash if you are working with megabyte sized .TRC files and you make heavy use of the filtering options.

You may have seen a little shareware utility called APISpy which performs the

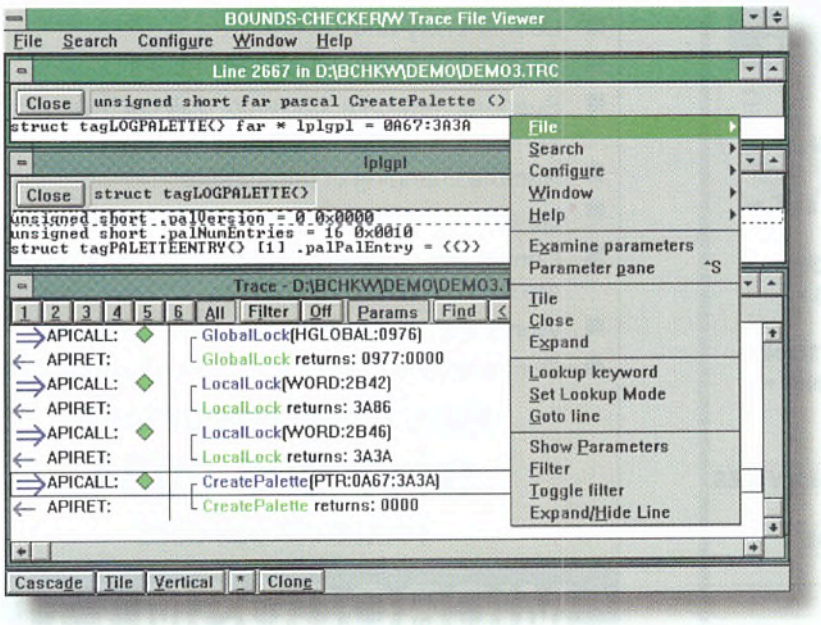

Figure 2 - Viewing a .TRC file with TView

simple task of spying on Windows API calls and logging them as they occur. If APISpy came across a `ShowWindow` call, it would use the `HWND` parameter to find out the title of the window, and the `int` parameter to find out which window visibility flag was used. APISpy would log the call something like,

```
ShowWindow(
  "Microsoft Word - BOUND.DOC",
    SW_SHOW ),
```

while Bounds Checker would log the call something like `ShowWindow(HWND:7B94, WORD:0005)`. To find out the same information that APISpy provides with Bounds Checker, you would have to resort to using TView's 'lookup keyword' feature, which just launches the Windows API Help file that came with your compiler and plonks you at the topic that describes the ShowWindow API function - you are expected to find out what the 5 corresponds to. You may even have to resort to searching through WINDOWS.H!

With API calls that include a string parameter, e.g. `DrawText`, you don't get to see the string unless you go through a laborious process. First you make sure that the `Draw-`

One more Bound

Bounds Checker for Windows v2.5 has just been released. The new features added since v2.2 (which this article covered) are:

- validation of 16-bit applications in Windows 95 (beta 3),
- parameter and return code validation for dynamically loaded MFC DLLs,
- trace support for MFC (2.50) calls in TView.

Support for Bounds Checking 16-bit windows apps under Windows 95 now gives developers a chance to move to Windows 95 as their development environment, instead of being tied to Windows 3.1 to use Bounds Checker.

Essentially the last new feature removes the hassle of using the separate MFC Tracer program (which comes with Visual C++) to trace MFC calls/messages. Bounds Checker does not support static linking of the MFC code - only dynamic linking is supported. This shouldn't prove to much of a problem as this is the more common way of using MFC.

Comparing Bounds Checker with Spy++ (in Visual C++ 2.x), it becomes clear that more polishing of the user interface is required for Bounds Checker. It maintains its technical superiority, but could just do with looking nicer!

Another observation: With calls such as **ReadComm** and **LoadString**, you supply a pointer to a buffer (to be filled) as one of the parameters. Well, when TView records the event, i.e. the fact that the API function has been called, it records what was in the buffer *before* the call is completed, so you can't see the effect on the buffer.

Also Matt Petriek said to EXE at the Software Developers' Show that he considers the 32-bit version of Bounds Checker 'superior' to its 16-bit counterpart. The amount of problems detected is increased and some errors are brought up automatically, reducing the number of mouse clicks necessary.

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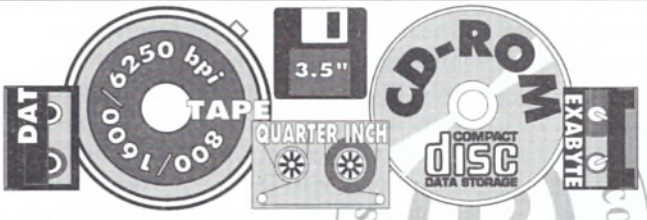

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Text function is the one highlighted in the log, then you select the Examine Parameters option, which creates an MDI window that contains the parameters' types, names, and values. String parameters merely show the pointer's value - to see the actual string you have to click on the parameter which creates another MDI window containing the string. If, as I do, you like the way CodeView presents variables in the watch window i.e. keeps things together, and expands structures with a new level of indentation, then this will be increasingly annoying to you.

Bounds Checker makes a poor attempt at interpreting the parameters of API calls, and messages. You may get the occasional glimpse of LMEM/GMEM_XXXX, and WS_XXXX flags, but that's about it.

Don't throw away your copy of Spy or Winsight - you may still need it. Spy and Winsight are quick and convenient to use because you just point to the window you want to spy on - and you only get the messages for that window. There is no similar way to filter out the messages for a particular window in Bounds Checker - you have to look for messages with the same HWND value. To its credit, it does indicate undocumented messages. So if you suspect that a certain application is using an undocumented message to perform a wonderful feat - Bounds Checker could confirm this for you. The reason why undocumented messages are given special attention may be due to Matt Petriek who was heavily involved in the book *Undocumented Windows* and Bounds Checker. He is also the author of *Windows Internals* which shows how Windows works!

Do your alphas betas Cs

Bounds Checker can have an important role to play during the alpha and beta stages of a development, when dedicated testers finally get the opportunity to wreak havoc on the application. It is usually difficult for testers to describe to developers how to repeat a crash or bug, especially when the bug is a sporadic one. With Bounds Checker, when an API error, or a memory overwrite etc. occurs, the tester can leave a comment in the log describing what they did leading up to the problem. All the developer needs is the .LOG and .TRC files, plus any data files that were being used at the time, to try and diagnose the problem.

Bounds Checker is simple enough for a non-developer to use. There is even a special 'silent-mode' option, that stops Bounds Checker from popping up when an 'error' is detected (it just logs the error), which helps prevent testers being frightened.

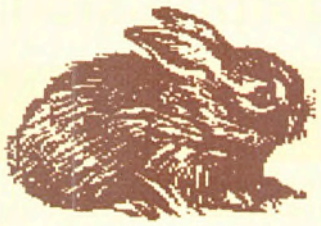
If you currently use Microsoft Test to perform a test suite on your application, then you will be pleased to hear that you can automate Bounds Checkers functions and options via your test scripts. And just think, you can go one stage better than Microsoft did during the beta of Windows 3.1 which just came with Dr Watson as the post-mortem debugger!

A magic wand?

If you think Bounds Checker will wave a magic wand and find all your bugs for you automatically, then you will be disappointed. If, on the other hand, you want to look in detail at what your application (or your competitor) is doing, have a good testing procedure and want to increase the likelihood of finding bugs or improve the information returned by your testers, then Bounds Checker may be just for you. ■

Colin Smith is a software engineer at Trans-Send International Ltd, developers of Trans-Send CommsCentre. He can be reached via email at colin@transend.demon.co.uk or by telephone on 0181 236 0117.

Bounds Checker is available from System Science (0171 833 1022). For one environment (Windows 16-bit, NT, Windows 95 or Win32s), it costs £195. With Soft-Ice the price is £379.



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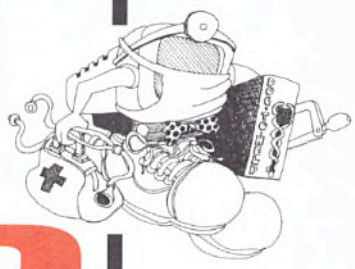

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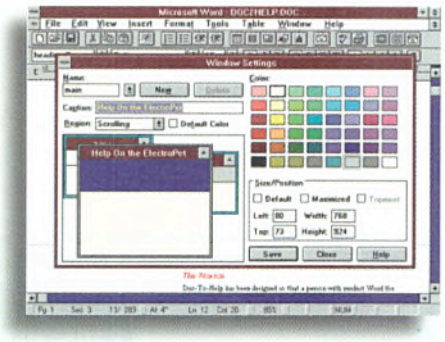

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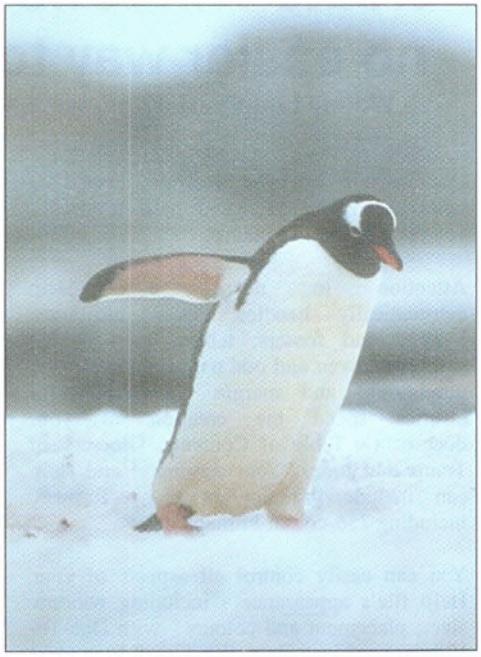

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Have you ever wanted to create a DLL but only know Basic? **Robert Stimpson** found a way to develop DLLs without having to resort to C.

If I could program in C, the challenge of creating DLLs for Visual Basic would not arise! It's not that I don't like C or that I cannot understand it; it is simply historical fact - my path to programming started with fluids modelling on a mainframe with FORTRAN. QuickBasic and MASM converted me to the PC, and here I am, currently with Visual Basic, with just a slight twinge of jealousy over the additional tools at the C++ programmer's fingertips.

Visual Basic (VB) gives the programmer a first-class development and debugging environment for Windows programs. It allows the creation of 'compiled' code in .EXE format (albeit P-Code which requires the VBRUN-xxx.DLL to execute it), but poses one major problem - you cannot create function or utility libraries in the true tradition of the DLL principle. Previously, the only way to create a DLL which could be called from VB was to program in C, typically Visual C++, and use the Windows SDK to create a DLL to serve the VB program. This is not a practical option for most VB programmers.

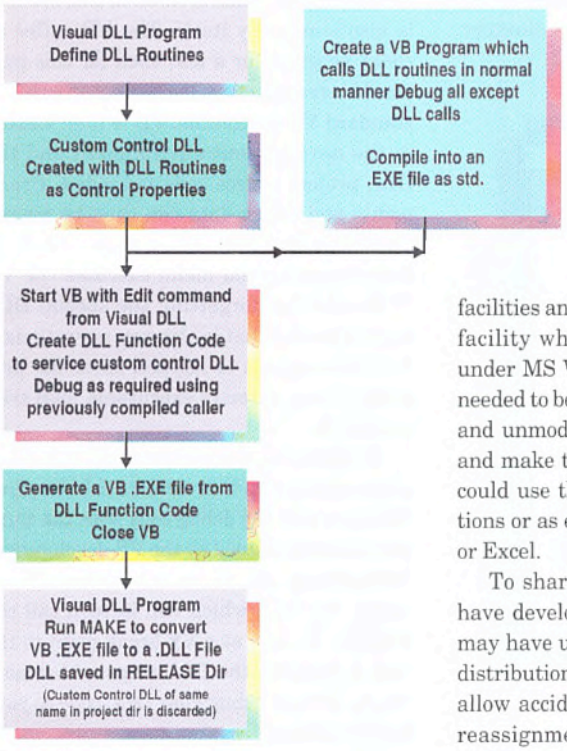

Figure 1 - DLL creation process for Visual DLL

For real programmers

I wanted to be able to provide my VB code with some fundamental resources to allow it to match the versatility of Microsoft's DOS Basic compilers - BC7 and QuickBasic - such as DOS and BIOS interrupt calls, and other low-level facilities and also take advantage of the DLL facility which *real* programmers using C under MS Windows take for granted. I also needed to be able to create a rigorously tested and unmodifiable suite of analysis routines and make them available to colleagues who could use them either in other VB applications or as embedded functions in Lotus 123 or Excel.

To share a set of library functions you have developed in VB with colleagues who may have use for them usually requires the distribution of *naked* source code. This may allow accidental corruption or inadvertent reassignment of variable values to occur, removing any benefit the original concept of shared code might have had.

Basic languages for DLLs

My first approach was to examine the MASM route to the DLL, but time was not in great abundance, and so I needed to discover what, if anything, existed to write DLLs in Basic. Initial calls to QBS and Grey Matter revealed GFA Basic for Windows as an option from the latter, but not from QBS, who did not stock it routinely because they did not consider it an adequately supported product in the UK. With this caution at the back of my mind, the GFA Basic compiler and interpreter arrived from Grey Matter and I then sat down to create my first DLL using Basic.

More recently I discovered Visual DLL from Simply Solutions on CompuServe, having decided to trawl through a FIND using only DLL as the key. (You can find Visual DLL under GO SIMSOL). Having downloaded and tried the demonstration model available there, an order was placed direct with Simply Solutions (California) and 48 hours later Visual DLL arrived in its slim ring binder.

Taken together, the two products solve all of the programming challenges that exist for me, using VB to its limits. Each has different benefits and drawbacks, GFA being the bigger challenge of the two.

GFA Basic provides a Windows development environment which allows you to create a truly compiled Windows executable or DLL with no P-code in sight. Visual DLL (not to be confused with a shareware product called VBDLL) runs in parallel with an existing VB installation and provides the facilities required to create a VB executable and convert it into a DLL which can be called from any other application possessing a DLL caller interface.

Simply stunning solutions...

Visual DLL provides a development environment in which you define the routines to be placed inside your DLL. Each routine is named and you also define the names and types of each parameter you want to pass to the DLL routines. Selecting EDIT from the Visual DLL menu or using the EDIT push-button on the button bar first creates a new project sub-directory below the Visual DLL

directory, and then starts up VB to allow you to create the source code for the DLL routines as if the routines were properties of a control, placed on a form.

After writing and testing the code in VB, you then select MAKE EXE in the normal manner and exit VB. Returning to Visual DLL running in the background, you then select MAKE from the project menu, and Visual DLL does its magic, taking the VB .EXE and creating a DLL from it.

Simply Solutions has been very clever in designing how Visual DLL works (see Figure 1). The *MAKE DLL* command creates an executable DLL code *shell* around the VB.EXE code so that DLL users or callers call the Visual DLL *wrapper* functions. These pass their arguments to the enclosed VB routines which execute as internal Microsoft P-coded routines in the normal manner, calling any other required DLLs including the `VBRUNxxx.DLL`. Since the VB compiled P-code and its operation is unchanged, it is guaranteed to run flawlessly.

All of the routines to be incorporated within a new DLL (`Functions` or `Subs` as declared by the user or caller), are all created as `Sub` in the Visual DLL Custom Control. Where a return value is to be provided (as with a `Function` call) the last parameter of the DLL `Sub` declaration will appear as `ReturnValue AS ...`. When running, the Visual DLL wrapper catches the returned value from the VB executable and returns the required parameter to the caller.

Returning VB strings from a DLL

Returning a string is a special case. Since the DLL created will be a true DLL, complete with local data and VB data segment (as if it was a VB.EXE application in its own right) simply defining and returning a VB string will fail. A string created in the DLL will use the VB string space applicable to the DLL, so to return the string you must pass the address of the DLL string handle back to the caller as a pc and courier, although the caller will declare and use the return parameter as a string.

The MAKE process in Visual DLL also generates header files for both Visual Basic and C callers of the new DLL.

The invisible VB program

What Visual DLL actually does when the DLL is called, is to load the DLL into memory, extract the VB executable *invisibly* to the local TEMP directory and execute it as an invisible task. The caller only sees the DLL interface, and all of this clever interfacing to VB is confined to the background.

The development stage of creating the DLL also warrants special mention - after defining the routines you want to see within the DLL, selecting EDIT from the Visual DLL front-end creates on-the-fly a unique Custom Control DLL (rather than a VBX) which contains definitions of the routines you have specified. Each of the DLL routines has become a property of the custom control on the form. Double-clicking the mouse on the custom control brings up the code window for the custom control, allowing you to edit the code in each routine. Figure 2 shows Visual DLL's front-end.

This development stage custom control DLL has the same name as the final DLL you want your VB code to ultimately reside within, although it resides within the project directory which was created by Visual DLL before VB was fired up. The final *encapsulating* DLL containing the VB executable code is always located in a directory called RELEASE which is below the project directory.

The development stage DLL thus has interfaces to call VB development level code within VB, exactly like a standard custom control .VBX or .DLL loaded in the normal manner. The RELEASE directory version contains the final VB-coded executable in its DLL wrapper.

Simply Solutions has addressed this possible area of confusion both in the manual, which is clear and concise, and also in the header files and documentation produced along with the creation of the Visual DLL for each DLL project.

One drawback to this process is that the library routines created are not currently fully re-entrant (this will be fixed in an imminent upgrade release), so recursive function fans must create function-within-a-function interfaces so that the recursion occurs entirely internally within the DLL. This appears to be an effect of using VB in this way, since the main caller application and the DLL are separate VB applications communicating via a DLL interface.

Debugging DLLs

Debugging the DLLs created in this manner is also simplicity itself. The VB caller or client program (or a test shell for this purpose) is created, compiled and set to run as a standard VB executable. VB is then started in the development environment and the DLL project source code is loaded. Break points and debug data can then be set up. Once this has been done, selecting RUN from the command menu executes the VB DLL code (not forgetting the special DLL custom control that is also now operational). Nothing appears to happen since the program has no directly executable load-triggered code.

Now start up the compiled VB *caller* program. As soon as this calls a DLL function, Windows sees the debug copy with the same name already loaded by the VB development environment and creates the instance interface to the DLL which will in turn call the VB code. As soon as a VB break point in the code is reached, the DLL stops mid-stream for you to then debug your DLL code to your heart's content.

Two words of caution here though. Executing the VB *client* with the DLL code

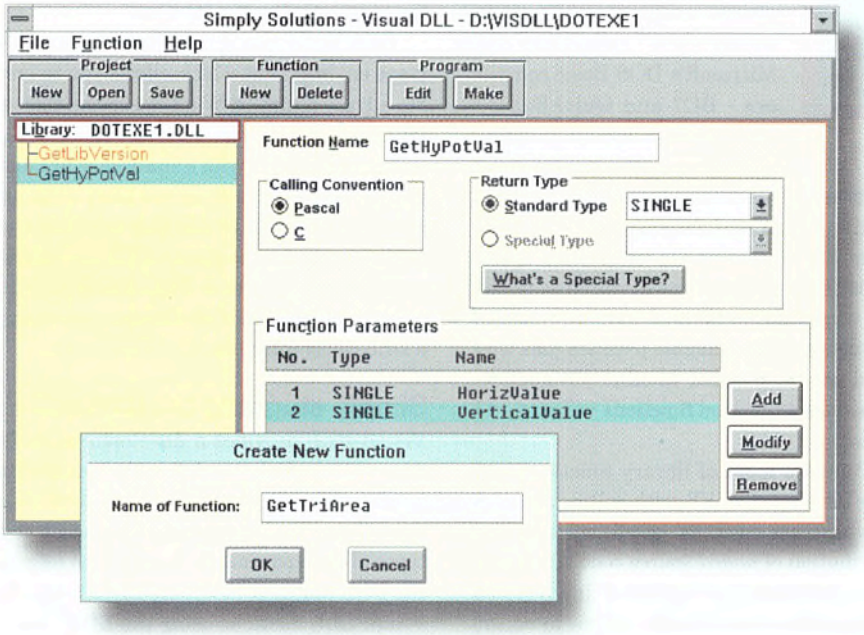

Figure 2 - Visual DLL interface

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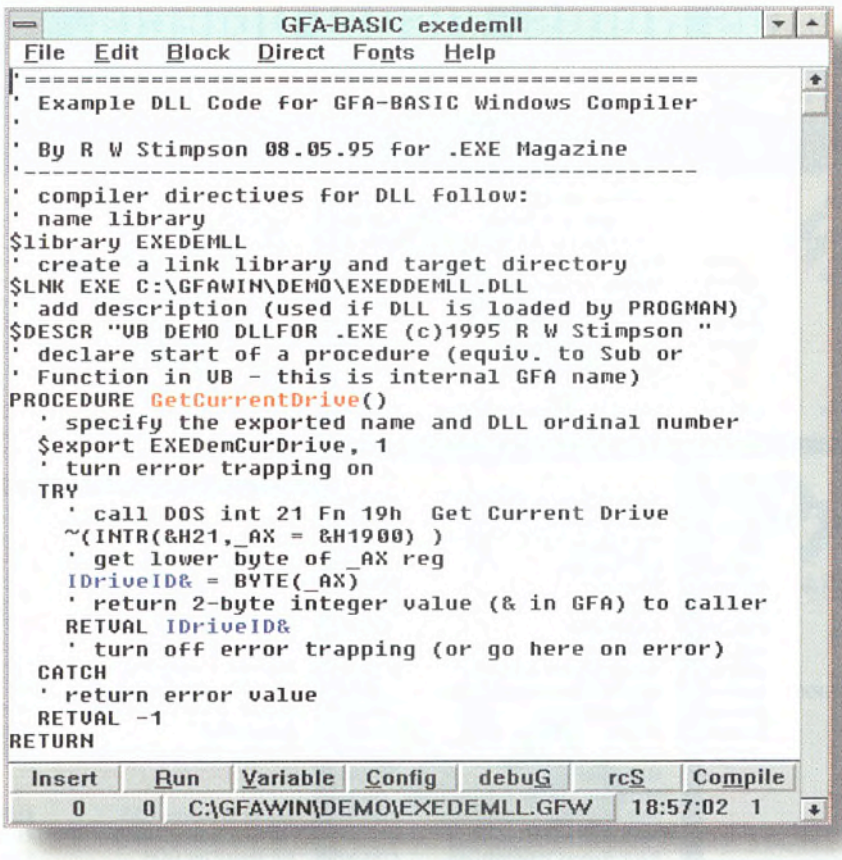

Figure 3 - GFA Basic development environment.
GFA Basic code to create a simple DLL and VB caller declaration

loaded but not running under VB's development environment will cause a GP Fault (understandable really, considering the DLL has its code currently residing in a glorified text editor). Secondly, VB keeps track within its executables of where it has called external DLL routines, and displays error messages if you try to call a function again before the debugging process has been completed and the call has returned to the VB executable.

Extending Visual Basic

One minor drawback of this simple but brilliantly effective technique is that while Visual DLL provides an effective way to distribute your library code in this manner, it does not extend the capabilities of VB as a language. This is where GFA Basic comes into its own.

GFA Basic has origins going back to the Atari - and unfortunately it appears to have been developed for Windows in isolation from the integrated development environments used by Microsoft in QuickBasic 4.5 and Basic 7 PDS for the PC. GFA's development environment is very similar to PowerBasic's DOS development environment (albeit a poor relation), but with a quirky Basic dialect, which makes variables double precision reals by default, is unable to use single precision reals, and has other irritating limitations (all variables are global unless you explicitly and individually say otherwise) which makes it appear to be the illegitimate offspring of an unfortunate liaison between GWBasic and Visual/QuickBasic combining some of the weaker points of both.

Having said all this to make sure you are aware of the challenges to be faced, persisting with GFA is worth the extra hassle for a seasoned VB or QB programmer - the end result is a blisteringly fast and compact DLL. Combine this with a huge selection (approaching 800) of internal GFA functions, including the ability to bit shift, pack and unpack bits, bytes, words and dwords using GFA native functions and your programming repertoire is considerably enhanced. The GFA Basic language also allows painless calls to interrupt 21H functions. The error trapping interface within GFA Basic is far more user friendly than the Microsoft ON ERROR... offer to date - simply enclosing a section of code in a routine with TRY...CATCH will end the routine at CATCH if no error occurs, or transfer processing to after CATCH if an error is detected (see Figure 3).

GFA or Visual DLL?

GFA's strength is in the production of truly compiled DLLs which execute exceptionally fast and are as good as the ones generated by Visual C++. GFA bundles a custom version of the OptASM linker to produce the compact .EXEs and .DLLs for Windows after the GFA compiler has been let loose on your GFA source code (don't try VB code - there are major syntactic differences!).

The primary use for GFA Basic as I see it will be to produce a DLL of functions which once declared within a .BAS module will give VB programs global access to the DLL, allowing VB to be extended to the enhancements that GFA offers, without the hassle of re-conquering GFA every time I need to use it.

Visual DLL has the ability to work with VB 3.0 and the forthcoming version 4.0 UK. During the coding of one routine, I inadvertently selected C Calling Convention. Upon loading VB3 the warning text comment appeared in the code window 'Decl is only supported in VB4' - so now you know!

GFA Basic is a unique and powerful contender within the Windows field, but you must be aware of the quirky interface, poor documentation and minimal support in the UK. (All technical support queries are referred to the German HQ of GFA since the reseller does not use the product. It is probably best to get support directly with Germany using CompuServe - GO GFASOFT) If you are prepared to embark on a steep learning curve to produce a tight, fast DLL using a syntax and language which is 80% MS Basic, 15% GFA and 5% C, then have no fear.

To conclude, the only drawbacks I have found with Visual DLL are that you cannot set the ordinal number of the DLL functions created, and you are limited to the facilities of VB to create your code. GFA has a generally richer language set, produces a pure executable of exceptional speed, but has an abysmal development interface and crude debugging facility. If GFA were to gain the interface VB possesses it would be totally unbeatable. However, it hasn't, so these two secondary products are destined to reside in complimentary arenas, supporting VB as the primary Windows development host.

■

Bob Stimpson is involved with the application of VB to the solution of Engineering Design Software problems across PC-Unix platforms to provide bespoke CAD/CAM design packages. He can be reached on CompuServe id: 100537,235 or at home on 01260 298499.

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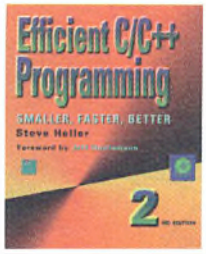
Book review

Efficient C/C++ Programming reviewed by **Bob Swart**



This book provides C and C++ programmers with several real-world examples on how to optimise their code. Unfortunately for C++ programmers, only one of the eight chapters is about C++ efficiency, the others are only on C.

Efficient C/C++ programming optimisations are presented at the algorithmic level, which is always more effective than plain syntax code optimisations (an assembly version of bubble sort is still slower than a plain C/C++ version of quick-sort). I'm very happy that the author never fears to use Turbo Profiler to show the effects of his optimisations or to find the bottle-necks in his code. Heller feels that you cannot guess where the bottle-neck is; you must actually search for it and check to be on the safe side!

Sorting, hashing and data compression are among the several real-world programming techniques and algorithms covered here. *Efficient C/C++ Programming* also introduces a new, so-called 'quantum' file access method which allows efficient access to variable length records. Each subject is covered in a separate chapter, and each chapter consists of two parts: first, the introduction to the problem and detailed analysis with a fast solution, and second, the source code itself. Often, however, the source code consumes more pages than the text itself, which gives the feeling that the book is more a source code listing than a textbook with algorithms (I counted 229 pages with code listings out of a total of 411 pages!) I'd have preferred a kind of mixed approach where interesting parts of the listings are interwoven with the text. Now, more than half of the book will remain unread, as it is just plain code that can be found on the accompanying code disk. Another weak point of the book is the rather short index of three pages. Even the little amount of actual text deserves more than three pages especially when the authors own 'quantum' stuff gets a whopping 21 references.

Now, please don't think that this is a *bad* book. On the contrary, I rather liked it, as it's one of the first efficiency books to truly deal with real-world problems and their solutions. The author shows his experience while treating the different problems and examining possible solutions and their efficiency. The use of Turbo Profiler shows that Heller really knows that only the final cold facts count. I wish that every C/C++ programmer (or at least those who work with me) had read the book and so made good technical decisions prior to building a new application. So no unpleasant efficiency surprises will await when the application is ready but slow as an old dog.

If you're not afraid of the unnecessary code listings in the book and if you know that C/C++ efficiency is an issue for you, then this book should be on your desk. If you don't care about efficiency, or think that any performance problem can be solved by adding a bigger CPU or more RAM, then I still invite you to read this book and see if you think the same afterwards. I think not. This book is an indispensable cookbook for the art of real-world efficient C/C++ programs.

Verdict: Recommended ✓

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SOFTWARE TEAM LEADERS & PRODUCT INTEGRATORS

£20k-£26K + Benefits

Software Team Leaders act as the Design Authority for products, being responsible for scheduling work, planning, setting deadlines and providing post implementation support, whilst still being hands on enough to cut code when needed. 'C' and UNIX technical skills are essential. Product Integrators act as the facilitator of change for products, with reference to new methods, for example, managing the implementation of a common GUI front end across the product range. 'C', UNIX and OS/2 skills essential. ***Ref: BVS/STLP1.***

SALES SUPPORT & SITE SUPPORT ENGINEERS

£18K-£26K + Benefits

In association with the Account Manager, the Sales Support Consultant is responsible for all pre-sales activities; presentations, scoping, demonstrations, prototypes etc. For this high profile role some Voice Processing experience is essential. The Site Support Engineer is responsible, world-wide, for post-sales customer support/systems implementation. UNIX systems administration skills and the mobility to work anywhere in the world (for up to 3 months at a time) are pre-requisites. ***Ref: BVS/SSE.***

PROJECT MANAGER

£24k-£30K + Benefits

The Project Manager is the prime interface with the customer, responsible for all aspects of the business including integrating hardware and software, managing finances, resources and suppliers. Customer satisfaction and project profitability will be key measures for success. ***Ref: BVS/PM.***

GRADUATE SOFTWARE ENGINEERS

£11.5K-£13.5K + Benefits

Investing in the future, Brite are looking to recruit a number of recent/fresh graduates. A Computer Science (or similar) degree is essential, a placement year and 'C', UNIX or OS/2 technical exposure is preferable. ***Ref: BVS/GSE.***

All these positions are based at Brite's European Technical Centre in South Manchester.

Brite Voice Systems is committed to providing quality information applications which exceed the expectations of their customers and add value to their business. Crucial to this is their skilled and dedicated workforce. If you would like to be part of this team, then send your CV to David Voice at the address below, quoting the appropriate reference and your current salary. If you would like to find out more then call either David Voice (evenings/weekends 01925 267828) or Shaun Plant (evenings/weekends 01298 23039).

Rullion Computer Personnel Limited, Permanent Division, Trafalgar House, 110 Manchester Road, Altrincham, Cheshire WA14 1NU. Tel: 0161 941 5335. Fax: 0161 929 5676. email - davidv@rullion.demon.co.uk

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RPG400 Developers including analysis, programming and support (rural location).	**£19,000-£22,000**
AS400 System Assistant including RPG400 development.	**£15,000**
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£17-£35K + benefits — **REF: SC/01/EXE**

WINDOWS OR X-WINDOWS/BANKING — **ALL LEVELS**
Three city clients require windows skills at any level. Other relevant skills are SQL server, Transact, SQL, UNIX, VMS or MS-DOS, C, C++, Open Client (DB and Net library), MFC, Open interface and APT. Exposure to analysis, developing user interfaces and rapid development techniques. Full training in Middle Office/Production and Front Office Systems including: Financial and Management Accounting, Treasury, Equity, Fixed Income and Derivatives.
£20-£25K + Banking benefits — **REF SC/02/EXE**

C AND C++ PROGRAMMERS — **ANALYST PROGRAMMERS**
Excellent opportunities exist for bright graduates with one year + experience. Personal background requires a solid understanding of the project life cycle and a commitment to high quality coding. You will be trained in all aspects of Investment Banking, relational databases, 4GLs and Object Orientated Design. A good opportunity for a second career move.
£17-£25K + Banking benefits — **REF: SC/03/EXE**

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A wide variety of specialist, leading edge IT companies in areas as diverse as: **ROBOTICS, TELECOMMUNICATIONS, MULTI-MEDIA, GIS, BUSINESS MODELLING, FINANCIAL/TREASURY, EMBEDDED SYSTEMS** and **SOFTWARE/GUI RESEARCH/ MANUFACTURING** require high calibre software development staff at junior and senior levels. Technical skills required include: **C, C++, VISUAL C++, VISUAL BASIC, X-WINDOWS/MOTIF, GUI's, NT, TCP/IP/X25/X4000, PROGRESS, SAP, Relational Databases, INTERNET CONNECTIONS** and **ATM** (Communications not ATM machines). — **REF:/04/EXE**

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Additional experience of: SQL, Forms, C and C++ required. We currently have client companies including Management Consultancies, Systems Houses, Systems Vendors, Bank and Finance clients looking for candidates with: Relaticnal Database design, Database tuning, Systems Administration, DBAs, Pre/Post Sales and solid programming knowledge and expertise. Please call to discuss your particular requirements.
£18-£40K + benefits — **REF: SC/05/EXE**

C/C++/VISUAL BASIC - UNIX OR MS-DOS — **DEVELOPERS**
Software House and End Users in Finance, Banking, Manufacturing, Commercial, Scientific and Government application environments require excellent C skills. Both Windows development skills W/3, SDK, NT, X-Windows and Visual Basic or strong C, C++ solid operating systems and good application knowledge are again much in demand. Software development experience is the key, and being able to deliver high performance, high quality, well specified software incompetitive time scales. Opportunities vary from small to large software companies involved in expert systems, GUIs, Image Processing, GIS, EIS, Communications, Networking and Object Orientated Databases. Graduates through to senior software engineers/team leaders are required. Please call to discuss.
£14-£35K + Benefits — **REF: SC/06/EXE**

UNIX/VMS/MS WINDOWS/NT MFC/C/C++ — **ALL LEVELS**
A degree in computer or natural science, two years solid C/C++ programming experience and a sound understanding of UNIX, VMS or MS-DOS are required to work on large scale programs with user interaction. You will need an intelligent problem solving approach to work and be a quick learner to programmer software in an X-Windows, Windows SDK or NT environment, port software to different systems and liaise with customers to drive through product improvements. Excellent career opportunities for the right candidates.
£16-£28K — **REF: SC/07/EXE**

LONDON/HOME COUNTIES WINDOWS SDK/NT DEVELOPMENTS
Senior Development Engineers — **To £30K + benefits**
Analyst Programmers — **To £27K + benefits**
Strong programming skills in C or C++ and Windows NT are pre-requisites for these positions. Experience in some of the following areas is also required: MS-DOS 5.0, MS Windows 3.1, Windows NT, Windows SDK, MS C 7.0, MFC, Visual Basic, Visual C++ and Microsoft NT. Also desirable are Windows XVT libraries or networking skills. — **REF: SC/08/EXE**

SOFTWARE ENGINEERS-SENIOR SOFTWARE ENGINEERS
Various Client/End Users, Software Vendors and Software Houses dedicated to strategic implementation of leading edge technology and integration of applications across different hardware and operating systems platforms require candidates to degree level with a scientific/technical development bias and 1-3 years experience. There are two main options:
TECHNICAL DEVELOPMENT: Continued use of UNIX, VMS, MS-DOS, C, C++, MFC, Windows (SDK, NT or X-Windows and Toolkits), Networking and Communications with companies offering technolgy based careers and management responsibility.
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Life in the Fast Lane

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Excellent opportunity to use your Electronic System development or your embedded software skills to move your career into pole position. You will be developing "state of the art" electronics and software used in motor racing world-wide. You need either a good grounding in Electronics (Digital/Analogue) or embedded software (MS-DOS, C, Assembler) and have the wish to work in a fast moving positive environment.
Contact: Adrian Wagstaff Quoting Ref: AW2604

Windows NT Drivers

Surrey/Berks borders **to 30,000**

Leaders in the development of innovative communications software seek a number of senior Engineers to develop their next generation software. You need to have Windows NT driver experience with C and C++. Preferably you need exposure to TCP/IP or Unix.
Contact: Adrian Wagstaff Quoting Ref: AW2603

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UK Wide **to 25K**

You've just finished your degree and are well pleased with your grade. You've put a lot of work into your project/work placement and are now looking for a challenging development role in multi-media, video or graphics applications. I have these roles available for you immediately. You won't find a better range of opportunities available to you... anywhere. Give me a call.
Contact: Mike Jenkins Quoting Ref: MJ2606

Multimedia - Advanced Graphics

Oxford, Cambridge & London **to 28K**

These three companies are in the top four of Multimedia/Interactive /CD ROM developers. The massive growth in their respective markets means that they are searching for good experienced Software Engineers. The two development platforms are PCs and MACs requiring experience of either C/C++ and SDK or C and MAC tools. These positions obviously require a high degree of low and high level graphics development so either previous multimedia or graphics experience would be an advantage.
Contact: Simon Drew Quoting Ref: SD2600

Surf the Internet

Cambridge **to 18K**

Specialising in internet access products this rapidly expanding company offers a stable, informal and challenging development environment. They are recruiting for a Windows based developer with experience of Visual C++, Visual Basic and an interest in the Internet to design overall code structure using OO techniques. In addition to new development work you will be involved in porting existing products to new platforms ie Windows 95 and NT. Additional skills of use include TCP/IP, Informix, HTTP, CGI.
Contact: Simon Drew Quoting Ref: SD2601

E Mail/Client Server GUI Gurus

Herts **to 33K**

This small, yet rapidly expanding, software company is embarking on the development of an advanced Windows-based mail enabled client server product. They have vacancies for 4 developers with 18 months+ experience of Windows development using either Visual C++, C++/SDK or Visual Basic on either Windows 3.x, Windows 95 or NT server. Additional experience of Access, SQL Server, modem based comms, ISDN, MAPI or the Internet would be useful. You will have direct responsibility for the design and implementation of individual system components.
Contact: Simon Drew Quoting Ref: SD2602

Virtual Window Drivers

Berks/London **to 35K**

Two clients with a common requirement for development staff to contribute significantly to next generation products. One develops advanced datacomms products and the other a suite of video editing software and hardware. In both cases a knowledge of C++ and WINDOWS/NT/95 or VxD is essential. All positions are senior roles and offer design authority.
Contact: Mike Jenkins Quoting Ref: MJ2605

For more information please call the appropriate Consultant on **01442 231691** days or **01908 222909** eves/wkends quoting the relevant ref no. Alternatively send your CV to:
Executive Recruitment Services
Boundary Way, Hemel Hempstead Herts HP2 7RX or fax CV to **01442 230063**.
email: executive@ershemel.demon.co.uk

THE DEVELOPERS REGISTER

Not on our New register yet? From April 1995 ASH associates started a New register for dedicated software developers who seek a career path driven by technology rather than management.
This is proving to be very successful with many excellent engineers having registered, finding or have already started with New employers.
We are now extending this option to engineers looking for their first move into contracting, we would like to hear from engineers from all areas of Technology who want to make this move Now or in the Future and we still seek those seeking a new permanent position.

NEW THIS MONTH

Exciting New Permanent Positions for UNIX and C Software Design Engineers based in Europe. You can expect a High Technology development environment working for the European Space Agency. this combined with High rewards. Speaking a foreign language is unnecessary with English widely spoken and essential for these positions.

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MULTIMEDIA DEVELOPERS

SIMIS Limited produces top quality simulation and entertainment software for PCs and all popular emerging formats, which are brought to the public through some of the best publishers in the world. We are now expanding our UK development organisation with a Multimedia group to develop exciting new edutainment products.

Team Leader

You should be a self-starter with exceptional project management , man management and organisational skills with a first class track record in Multimedia product development. You will be an inspiration for those that work for you and an excellent communicator.

PC / MAC Programmers

These exciting new multimedia developments require dynamic young software engineers with a minimum of 3 years experience developing C under either MS Windows or on the Apple Macintosh. Experience of hypermedia, graphics or animation would be useful, but not essential.

Graphics Artists

Ideally you will have worked in a multimedia environment, in the areas of design and layout or preparation of 2D and 3D animations, photographs and video sequences.

All of the above positions are at our Headquarters in leafy Godalming, Surrey. Our work environment is second to none with top of the range equipment, superb offices and flexible working hours. All of the jobs are offered with competitive salaries, Profit Related Bonus Scheme, Health Care and Pension contributions.

Carolyn Reed, Simis Ltd, Simis House, 90 Meadrow, Godalming, Surrey GU7 3HY
Tel: 01483 414344, Fax: 01483 414287, Email: carolyn@simis.co.uk No Agencies

SOFTWARE ENGINEERS

Simis Medical Imaging is a small software house specialising in X-ray viewing systems and information systems for hospital radiology departments. We currently have vacancies for one Software Engineer and one Senior Software Engineer to join our Development Team. It is essential that you are an excellent 'C' programmer and have experience in some of the following:

C++ or other Object Oriented Language
Windows (Workgroups or NT)/UNIX
GUI's preferably Windows SDK or Motif
Microsoft SQL Server/Oracle
Visual Basic

In addition to the technical background, candidates will be graduates with at least 18 months experience (for the senior position at least 3 years) and must be well organised and able to show initiative.

Carole Davies, Simis Medical Imaging Ltd, Headley House, Headley Road, Grayshott, Hants, GU26 6TU Facsimile 01428 606091

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JOB
DELPHI DEVELOPERS

LOCATION	SALARY
S.London	To £25K + Bens

Our client, a highly successful consultancy and product development group specialising in the financial sector has seen rapid growth in recent years. As a result, five development consultants are required to assist in new development and existing product migration. Applicants should have at least eighteen months Borland Pascal and SQL experience - excellent communication skills are also necessary. Successful candidates can not only expect a highly competitive salary package, but will be trained to use a Borland's Delphi client/server product.

REF: PP/1

JOB
'C'/C++/UNIX/RDBMS

LOCATION	SALARY
City	c£30,000

This international settlements house established in 1970 is now developing its next generation of software and is searching for two highly skilled developers with excellent 'C'/C++ programming skills under UNIX with experience of Oracle and/or Powerbuilder. You will need to have a strong academic background, with excellent interpersonal skills and enjoy working as part of a highly motivated team. This is an ideal opportunity to work with the latest technologies in a technically challenging environment.

REF: DE/2

JOB
MULTIMEDIA DEVELOPERS

LOCATION	SALARY
City	To £30K

Europe's leading CD-ROM publishing company is seeking to recruit Windows development and testing staff at all levels of experience. They are building teams now to work on a number of new titles to be released into Europe later this year. Ideally, you will have worked in a multimedia environment developing software under either MS-Windows or on the Apple Macintosh. Any experience of writing or using graphics software, sound or animation would be useful, but is not essential.

REF: FS/3

JOB
3D GRAPHICS/MULTIMEDIA

LOCATION	SALARY
Herts	To £16K

This is an exceptional opportunity to work for one of the leading international players in the multimedia field. They are now expanding their product range of multimedia enabling technology. As part of this expansion they are searching for a junior Software Engineer with 3D Graphics, 'C' and/or C++ programming skills under MS-Windows. Any experience of UNIX would be advantageous. Don't miss this opportunity to work at the leading edge of graphics and multimedia development. Call us now!

REF: DE/4

JOB
'C'/UNIX

LOCATION	SALARY
Home Counties	£18-£32K

High calibre Software Engineers are required by our client, a leader in Open Systems Technology. Suitable candidates will have at least two years 'C' programming experience in a UNIX environment. Knowledge of UNIX operating system development (kernel, utilities), assembler, level programming or compiler writing, although not essential, will be highly desirable. Working in a small, dynamic team, you will be involved in the development of new products and the support of existing products by investigating problems and creating solutions.

REF: LC/5

JOB
ORACLE DEVELOPERS

LOCATION	SALARY
Berks	To £30,000

This international provider of telecommunications services is growing at a tremendous rate and is looking for several Oracle Developers. Suitable applicants will have at least eighteen months experience of developing Oracle based systems, backed up by strong inter-personal skills. Any knowledge of Oracle Case, Forms 4, Reports 2, PL/SQL, Pro*C or Oracle Financials will be advantageous, although training is available. Successful candidates will be developing UNIX based Oracle financial and purchasing applications through all stages of the project life cycle.

REF: JD/6

CONTRACT VACANCIES - UK WIDE

Herts	**Visual C++ Analyst/Programmers**	3 months
London	**Visual C++ Programmers**	6 months
Cambs	**Visual C++ Programmers**	6 months
Berks	**Visual Basic Programmer**	4 months
London	**VC++/SDK Multimedia Developers**	3 months
Cambs	**VB/OLE Developers**	3 months
Surrey	**Windows/Financial Appls. All levels**	6 months
W. London	**Windows SDK/C Programmers**	5 months
City	**Windows SDK/C Developers**	4 months

REF: FS/7

City	**Mac/Windows Text Handling Programmers**	6 months
City	**Text Processing**	6 months
Cambs	**Text Handling Processing**	4 months
City	**Apple Mac Multimedia Deveopers**	6 months
Cambs	**Apple Mac CD-ROM Developers**	6 months
Cambs	**Multimedia/CD-ROM Developer**	4 months
London	**Sybase/SQL Server Software Engineer**	4 months
Surrey	**Visual C++/MFC Finance Developer**	6 months
London	**MS-Windows System Tester**	3 months

REF: FS/8

London	**Visual C++/MFC Developers**	6 months
Surrey	**Visual C++/MFC Programmers**	6 months
Oxford	**Visual C++/MFC Programmers**	3 months
City	**Visual C++/SDK Multimedia Developers**	3 months
W. London	**C/C++ Progs x 2**	6 months
City	**C++/Banking Programmers**	6 months
London	**Oracle, SQL, Forms Developers**	3+ months
London	**Windows/C++ Programmers**	6 months
City	**Windows NT Senior Programmer**	3 months

REF: FS/9

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DISCOUNT BOOKS

One for Delphi Newbies, One for Visual C++ Old Hands

Heavy Metal Visual C++ Programming

by Steve Holzner

600 pages

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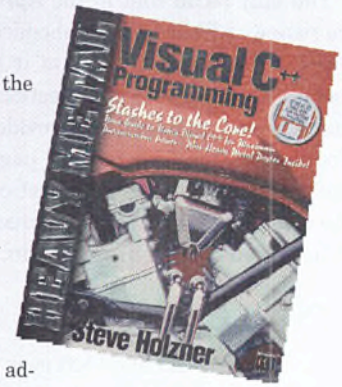


Your guide to using Visual C++ the way it was meant to be used, putting it's raw strength to work and picking up where beginner books leave off. If you're serious about your code and want to harness the full power of of Visual C++, this book will take you as far as you can go. Learn how to bend the rules to your advantage, get into the guts of a program and rearrange a program's internals to your liking. For intermediate to advanced programmers.

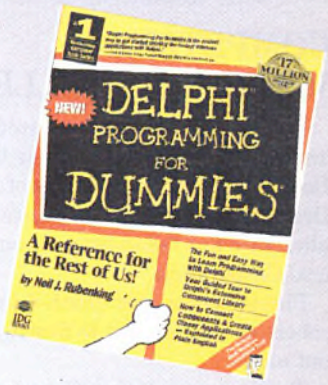
Delphi Programming for Dummies

by Neil Rubenking

400 pages

Normal Price: £18.99

☆ Price to You: £14.25 ☆



The title is no reflection on EXE's opinion on our readers! However, a nuts and bolts book for a brand new product and a boon for inexperienced programmers and, perhaps, those who have no background in Pascal. This results-oriented book jumps right into creating working programs by collecting and connecting Delphi's powerful components. Neil Rubenking, technical editor of PC Magazine, also gives you ten common mistakes to avoid, almost ten of the most useful built-in Delphi functions and ten API functions useful with Delphi. Loads of sample code. For programming newbies.

Selection	RRP	Your Price	Description
Heavy Metal Visual C++ Programming	~~£37.99~~	£28.50	SEE OUR OFFERS ABOVE
Delphi Programming for Dummies	~~£18.99~~	£14.25	
5OLE Wizardry	~~£28.95~~	£23.30	REFER EXE FEBRUARY to JUNE
C: The Complete Reference	~~£25.95~~	£20.80	
The Visual C++ Handbook	~~£25.95~~	£20.80	
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Video Compression for Multimedia	~~£29.95~~	£22.50	
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Leaping from BASIC to C++	~~£27.00~~	£20.25	
The GUI Style Guide	~~£29.95~~	£22.50	
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Developing PowerBuilder 4 Applications	~~£35.50~~	£26.65	
Heavy Metal OLE2 Programming	~~£38.99~~	£31.20	
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Aladdin	Security Systems	214	43
AP Professional	Software Developer's Books	203	28
Bits per Second	Graphic Tools	202	27
BL Security	Security Dongles	222	56
Citadel	Comms Library	221	55
Contemporary I	Development Tools	197	16
Contemporary II	Programming Tools	215	44
DES	Security Tools	226	63
FAST Electronic	Software Protection Device	201	24
Full Moon Software	Development Tools	199	20
Grey Matter	Programming Tools	191	2
Hypersoft Europe	Programming Tools	210	40
Intech Ltd	Communications Products	228	OBC
Intersolv I	Development Tools	194	11
Intersolv II	Development Tools	211	41
LPA	Development Tools	212	42
Nu-Mega	Programming Tools	224	58
Object Expo	Conference/Exhibition	229	21

ADVERTISER	PRODUCT/SERVICE	CIRCLE	PAGE
POET	Object Oriented Database	218	50
Popkin Software	CASE Tools	209	38
Premia	Development Tools	207	35
Programmers Paradise	Development Tools	195	13
QBS I	Development Tools	204	30
QBS II	Development Tools	223	57
QBS III	Development Tools	225	61
Rainbow Technologies	Security Products	198	18
Ridgeway Press	Computer Manuals & Printing	213	42
Sequiter	Database Tools	217	48
Sigma	Software Developer's Books	206	34
Silicon River	Development Tools	216	47
System Science I	Development Tools	193	9
System Science II	Development Tools	205	32
Systems FX	GUI Test Tool	219	52
Visix	Code Generator	190	IFC
Visual Components	Programming Tools	208	36
Zinc	GUI Library	200	22

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COMPETITION: WIN #1 BEST SELLER "DESCENT"

From the minds that created Microsoft Flight Simulator™ and Ultima I™ & II™ comes the mind-twisting action game Descent, with over 30 levels of high speed arcade-style action. Descent is set deep in the mines of the moon where an unknown alien race has taken over the out posts of the Post Terrain Mineral Corporation.

Players encounter death-defying mine shafts and menacing robots as they set out to destroy each command centre and get out alive.

To win a copy of this #1 best selling game send a post card to the usual address marked "Descent". We will make the draw on the 31st July.

INTERNET: THE CYBERIAN CONNECTION DISCOUNTED VIDEO

Purple Training, in association with London's Cyberia cafe, have launched Internet: The Cyberian Connection, the first ever video explaining how to get the best from using the Internet. The video offers step-by-step advice to Internet novices, telling you what the Internet is, how to get connected, what's available and how to get at it, how to join a discussion group, and how to send mail to any of the 30 million people using the Internet at the moment. The video normally costs £16.99 + VAT & shipping but is available to EXE Subscribers for just £14.99 + VAT & shipping. Contact Purple Training on 0181 742 0607 to place your order. You must quote EXE to get the discount.

FREE PHAR LAP EMBEDDED TOOLSUITE!

You may recall that in the April issue we reviewed Phar Lap's Embedded ToolSuite. We have one copy of it to give away. To win, answer the question "How many printed manuals are provided with ToolSuite?" (the answer is on page 17 of the April issue). Send your post cards to the usual address. The first correct entry to be drawn on July 31st will win.

LINUX CD

We have one CD ROM left over from the EXE Show. We were giving these away with new two year subscriptions and they were hugely popular. The set of four disks include complete Linux archives, complete GNU archive, Kernel sources up to 1.2.1, complete on-line documentation, DOOM (the game) for LINUX, Commercial demos and much, much more. To win this very last copy in our possession send in a postcard to the usual address to reach us by the end of July. Please mark your cards "Linux".

The Subscribers Club aims to bring you a selection of special offers every month. Please remember to quote your subscriber number when you order goods. For further information on any of the offers featured above contact EXE on ***0171 287 5000****, or contact the supplier directly when a number is given*

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Ctrl Break

Please send your rants, raves and competition entries to:

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Control Freak Geek

Information Week reports that the 'Registration Wizard' in the Microsoft's Windows 95Beta collected information from your computer and all other connected computers... then sent the information back to Microsoft!

1984 in '95? Well, we've all heard stories of the email messages that errant MS employees receive from Mr Gates himself. If the 'Registration Wizard' implications are to be taken to their logical conclusion then it would seem that not even the smallest of garage programmers will be safe as Bill makes efforts to keep tabs on dodgy code worldwide.

WORST WORLD WIDE WEB

... a little knowledge (of HTML) is a dangerous thing

Iambic software

http://www.iambic.icom/iambic
...with Newton Tip of the Month and Catchy Couplet Poetry contest.

Business on the move

http://193.131.77.142/botm
a range of top-ranking 'hotles' (sic)are pleased to offer you 'the smallest portable in the world' - a computer diskette. Presumably that makes a notebook and pen 'the smallest information storage and retrieval system in the world'.

The Brothers Karamazov

gopher://gopher.vt.edu:10010/02/72/1
The Brothers Karamazov by Fyodor Mikhailovich Dostoevsky in electronic text.

Do you...
a) turn your eyeballs to jelly
b) give up, ignore the rainforests and print the whole thing out on paper anyway?

Sweet Revenge?

The following was found by a Ctrl Break spy on a company notice board. Presumably the perpetrator had become fed up with being pestered for free advice and tech support by the newly en-Netted.

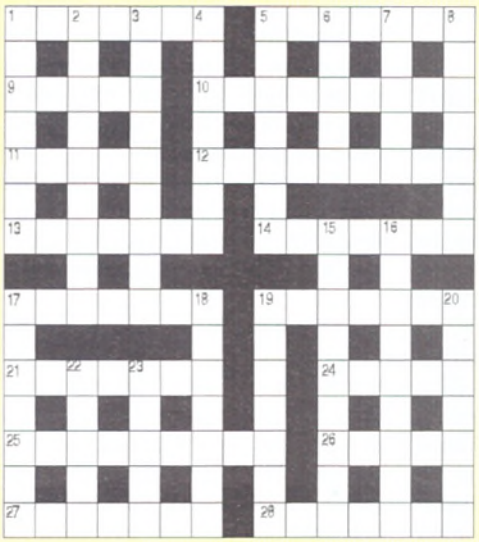
Tip of the Month: *Many people don't realise that modems 'clog up' with constant use, especially if you have been downloading a lot GIFs, TIFs and JPGs. The following simple procedure, carried out two or three times a week, will keep your modem running sweetly. Start your terminal program (e.g. Telix or Odyssey), and type ATDT999. The results will amaze.*

Hello again...

A small tip of the hat to Find-The-Spam
http://sp1.berkeley.edu/findthespam.html

dotexe.demon.co.uk has been credited for its work toward world recognition of these spam-drawing genii. Thanks lads. Think nothing of it... talent such as yours will always out.

PRIZE CROSSWORD



ACROSS

1. Software tool in Australian vehicle (7)
5. Little Sidney comes back, admits, gives up (7)
9. Sets of punched cards he mainly floors (5)
10. Air due to breaking up displays (9)
11. Belonging to them? Not here, I hear (5)
12. Spoil a signal with noise maybe (9)
13. Sorting with a mesh (7)
14. Bitings mis-reported with a +/- symbol (4,3)
17. On average half a disc spin cycle (7)
19. When the last errors may appear (3,4)
21. Try to sign up Rog for some collections (9)
24. What pointers do to and fro (5)
25. Home workers in the old days (9)
26. Provide new skills with a series of bits (5)
27. Trots along to take 22/7 back out of sweets (7)
28. They may use shells or bubbles in their work (7)

DOWN

1. Ape stud who comes round as he merges (7)
2. Ten NE MICR devices with a little bit extra (9)
3. Add charged particle into set or list for instance (9)
4. Such a gap is a sign of boredom (7)
5. Symbolises something of French paper money (7)
6. Thoroughly clean the largest university in a register (5)
7. To store data is not wrong it seems (5)
8. Partition a billion people in a group (7)
15. Currently produces reports ... (9)
16. ... and where they're stored for carriage (a brief example) (9)
17. I follow calculating number with educational computing basic to IT (7)
18. Americans pull the diocese back (7)
19. Tries to block the signal over masks (7)
20. 19 ac jobs may go wrong with simple gates (7)
22. Number base puts month on metal (5)
23. Flat beginning for article in Mid-East group (5)

SOLUTION TO JUNE'S CROSSWORD:
ACROSS: 1. VIRTUAL **5.** MACHINE **9.** LABEL **10.** NUMERATOR **11.** MOUSERS **12.** CHINWAG **13.** SADAT **14.** AMPERSAND **17.** SIDESTEPS **19.** WATCH **21.** LIAISES **24.** WHILING **25.** COLLECTOR **26.** INURE **27.** NUDISTS **28.** SEGMENT
DOWN: 1.VOLUMES **2.** REBOUNDED **3.** UGLIEST **4.** LANDSCAPE **5.** MIMIC **6.** CARRIER **7.** INTOW **8.** ENRAGED **15.** PASSWORDS **16.** ATTRIBUTE **17.** SILICON **18.** SYSTEMS **19.** WAITING **20.** HIGHEST **22.** AILED **23.** SITES

There are 3 prizes for this month's crossword: **Games for DAZE** - *a 2 CD set 'Plug & Play' - hundreds of the most popular games plus the X2FTP Game Programming Archive;* **World Wide Catalog CD-ROM, Summer 95** - *see the World Wide Web without being on line;* The **"Mother of Perl" & TCL/TK CD-ROM** *NEW* 2 CD Set. All of these are from Lasermoon. Send your entries to the address above.

Ctrl Break

STOB

The All-New Adventures of Verity

We have heard little of Microsoft employee Melinda French since her marriage last year to Bill Gates. Presumably she is safely installed in the Gates' Xanadu-like underground palace, with its computer controlled doors and myriad of other gadgets. But Verity is concerned...

Dear Bill

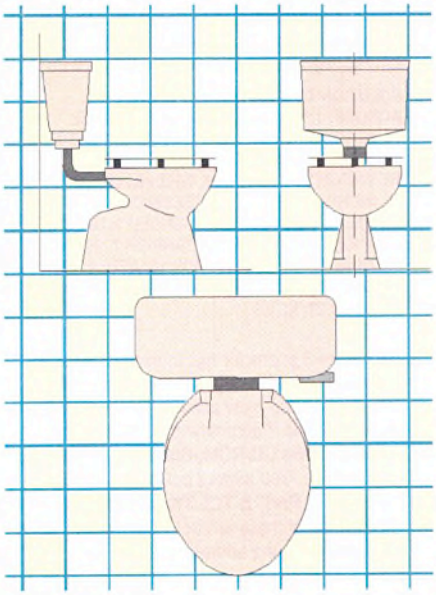
Tuesday

The shower went wrong this morning, so I called out a programmer.

It was my fault. I rebooted the bidet, owing to how it wouldn't flush, but was stuck on a modal dialog saying Wasn't that nice! Ok/Cancel and thought I would freshen up while I waited for it to finish its login sequence. So I stepped into the cubicle and waved my hand over the hyper faucet, and of course I got a stream of boiling mango-scented gel down my right boob, *Yipe!*, because, as Bill explained later in his email, the network DDE link with the boiler had gone down when I rebooted the butt-washer.

Then I got mad, which was kind of silly, because this sort of thing must happen to other people most days, and I pressed the emergency reboot button for the whole bathroom, which of course you mustn't do while the bidet is rebooting in case it picks up a stray interrupt and goes into its emergency back up routine. Which it did and it did.

I wouldn't have minded so much except of course I couldn't wash it off in the shower because the shower was still spurting molten mango goo, and I wasn't really in a fit state to call out the 24 hour programmer over the vidlink. So in the end I emailed him priority Urgent. It took him ages to get here, because of course you need LoveNest security clearance level to get through all the doors to our *en suite* bathroom and he had to literally hack his way in, so it was 4pm before I got to fix myself up and have a blueberry waffle.



I do wish that Bill were here, instead of an evangelising mission persuading the Native Australian Aborigines to use NT for boomerang design. He is such a practical man to have about the house.

Wednesday

And it's my birthday! Sadly, Bill couldn't make it back from Down Under owing to how he had to fly to Rio to get them to use Windows 95 in all their snowmobiles. But he hadn't forgotten; I was woken up in bedroom suite #3960 (which is where I am sleeping until they fix up the LoveNest bathroom properly) by the email thing going off with a new message. The macro substitution hadn't worked out quite right, but it was still Special. It said:

```
Dear <Employee First Name Tag>
Happy Birthday. We look forward to
another year of excellent work from
you.
Yours sincerely
<Friendly Line Manager Tag>
This message autogenerated by
Microsoft Scheduler(TM) for Windows
95(R).
```

And to think most girls have to put up with flowers!

In the evening, I held a virtual dinner party to celebrate my birthday. I asked Steve Ballmer, and lots of other Microsoft guys along. They all had a big party in the Microsoft executive canteen, and I had supper in the ballroom which is a great room but feels a little lonesome by yourself. When the link came up I said Hi and Steve said Hi Melinda and I said Mrs William Gates III to you and we all laughed, which was nice.

Anyway, we ate and I had matzo balls and I said Isn't there any other part of the matzo you can eat? which is from Dinnerania™, the Microsoft CD-ROM of dinner party jokes. Only nobody laughed because they were having pot roast and they couldn't see what I was having what with them being 20 miles away and when I tried to explain the link went down. Which was kind of sad because Dinnerania is in alpha and this is the only joke in the database and I had matzo balls special because as Bill always says, someone has got to do the alpha testing.

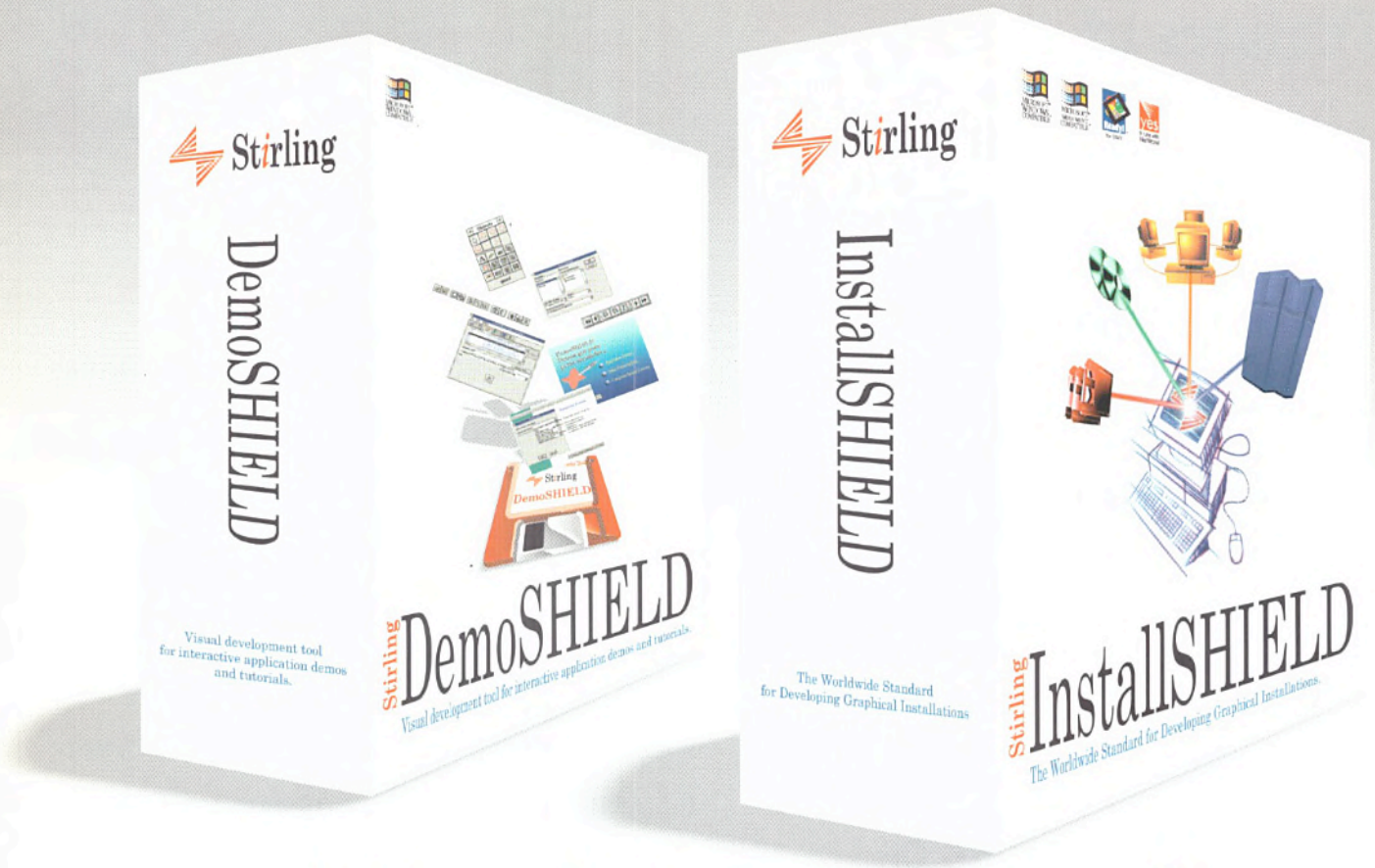
Friday

I have been going through some emotional pain this morning. Partially this is because, according to the house Newsnet system, Bill has had to go on to Red China, on account of them needing to be told how to use Microsoft Dictator™ for Windows for the Hong Kong project - I guess this must be our new voice recognition add-on for Office. Also I am still worrying about the joke in Dinnerania: what about all those dear little matzos that get hurt just so that persons can have dinner parties?

But mostly I am blue because the whole house crashed last night and when it came up again it had to go to its weekly backup security database which means it thinks I am in LoveNest when I am actually in bedroom suite #3960, which means I cannot open the door as I do not have correct security clearance. Also, there is no phone in here, as Bill thinks guests should be discouraged from using obsolete mainframe technology, and no windows, because the house is built under the hill, and as Bill says who needs windows in a room when you have got Windows®?

However, no need to worry! There is a terminal in here and I have emailed Bill to send help and look! I just got a reply. I just click on the little envelope and

```
Dear <Guest in bedroom suite #3960
Tag>
Thank you for your message. While
Bill is always keen to hear from
his guests, you will appreciate
that he is a very busy man, and he
can't always reply to his email
straight away. Your patience is
appreciated.
```



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