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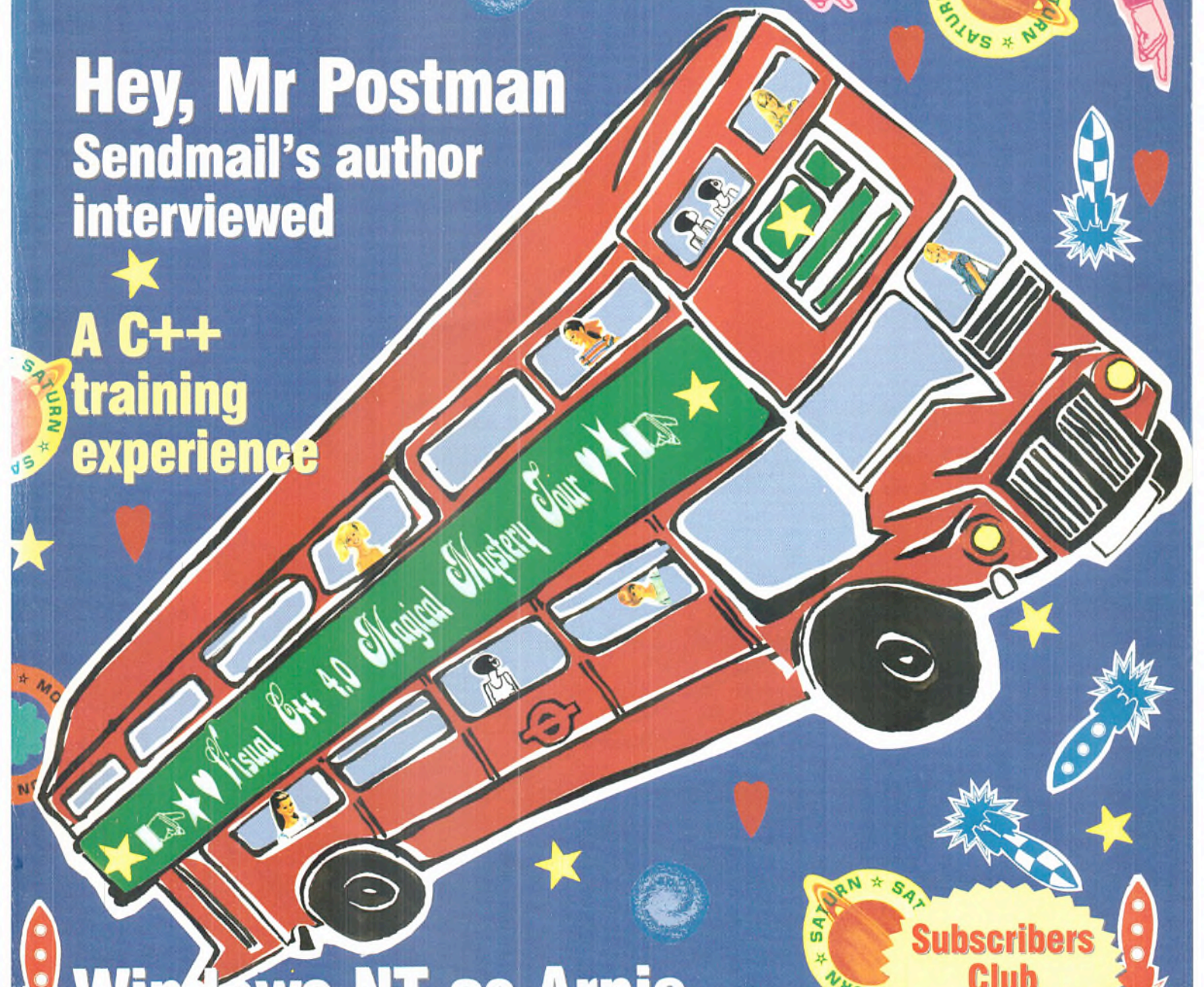

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COMMENT

Soap Flakes.....4
Why NT is like Arnold Schwarzenegger. Favourite shareware. Software development: an ethical issue?

Mayhem.....8
Jules got such a fright when he looked behind his computer and saw a truly horrible sight. Dead rats? Oxide from his disks? Three inches of dust? No, he found miles of wire. Why was he surprised?

NEWS

News Review.....10
Which network operating system on the enterprise server? Parallel C++. New MSDN. Patterns in software projects.

Products News.....14
Distributed OLE by NeXT. Stingray's two new MFC extension libraries. Symantec C++ 7.2. C reverse engineering.

Letters.....18
The more applications launched, the faster Windows 95 runs. Equality in C. Trickier than it looks. Learn Smalltalk and get rich.

REVIEWS

Back to school.....55
After two years of evenings spent learning C++ in his bedroom, Graham Kendall decided to get the topic onto his CV once and for all by investing in a computer training course.

Memoranda in xBASUM.....61
Born as a bit of an Ashton-Tate kludge, the xBase memo has evolved and proliferated. Colin Hume picks his way through a forest of formats.

Books & video.....68
Rob Kings reviews The Icon Book, and discovers what not to do in Sicily. Will Watts spends three fascinating hours in front of his TV with Borland Delphi.

FEATURES

Visual C++ 4.0 magical mystery tour.....20
Along with all the other Windows 95 bits, Microsoft is shipping a new version of its market leading C++ package. Scot Wingo takes us round a package with a surprisingly high version number.

Hey, Mr Postman.....26
The UNIX Sendmail program is as ubiquitous as the Net itself. Peter Collinson spoke to its author Eric Allman about how it came to be written, the latest version, and that infamous DEBUG hole...

TECHNIQUES

Five reuse cultures.....31
Software reuse is an oft-named goal of software methodologies - much less often obtained. Mary Hope argues that the failures and successes of reuse are dictated by the culture of the organisation.

Delphi component writing - Part 3.....37
In the concluding part of his guide to Delphi component writing, Dave Jewell completes the development of his better-than-Windows 95 trackbar control.

SQL - married to the Web.....45
Paul Richardson looks at the techniques available for interfacing SQL databases to the World Wide Web.

Bugs & patterns.....51
After playing at 'Spot the bug', Francis Glassborow presents his view on the relevance of 'patterns' for programmers.

THE BACK END

Sub Club.....70
Competitions, freebies and offers for EXE readers.

Ctrl-Break.....75
Pass Note of the famous future-ex-editor-at-large. Verity Stob tracks human inventions. Bill Proctor gives some object lessons. And Eric Deeson's crossword.

Recruitment.....72

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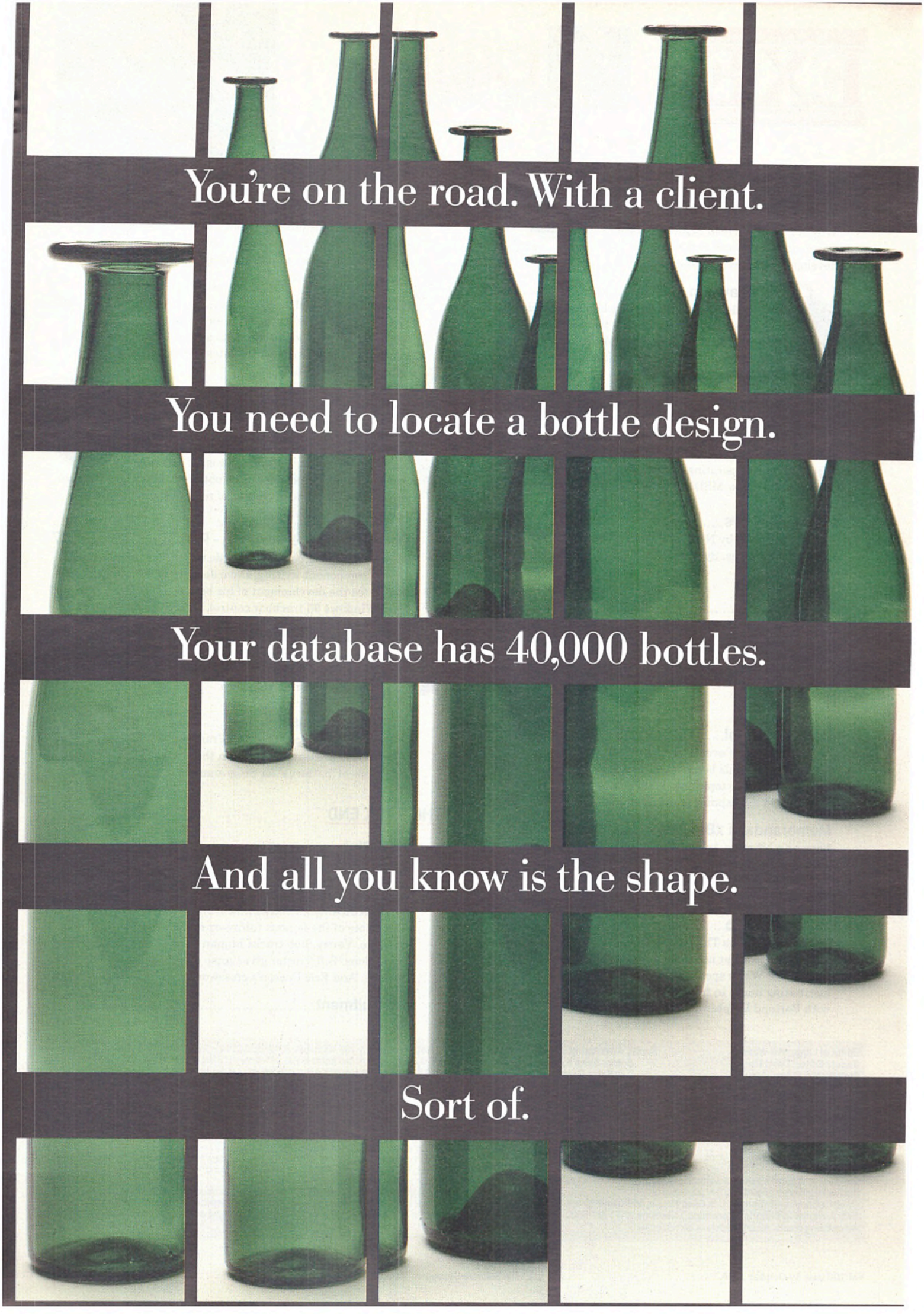
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SoapFlakes

MoonWater

I DON'T KNOW WHAT I'd do without my favourite piece of shareware, which is called MoonWater. You can get it for the Macintosh, for DOS (where it can be set up as a popup TSR if you so choose), and I hear that there is now a Unix version which goes down a treat under Linux; but I prefer to use the Windows version, which I have put in my start-up group so that I can always have it handy.

Windows programs always seem to be packaged as a flock of about a dozen files, most of which need to be installed in WINDOWS\SYSTEM, but not MoonWater. When you unzip the archive, there are just four items: README.1ST, MWMAN.DOC, MWW.EXE and MWW.HLP. MoonWater wants an INI file, MW.INI, to save its configuration, but it recreates this in its home directory when you run it - the authors are very keen that MoonWater should be a 'download and go' program. So there are dozens of command line switches for those who like command line switches, but you don't need them, because MoonWater lets you set up the INI file with a couple of tabbed dialogs, or you can edit the file directly with a text editor if you prefer. The DOS version of MoonWater will use the same INI, and if you want to share a single copy across a network you can easily set an environment variable so that everybody uses their own settings.

A word about MoonWater's menus. Of course, most applications will give you context sensitive help if you strike F1 with a menu item highlighted, but MoonWater is the only one I know which gives help on a greyed out item *explaining why it is greyed out*. Everybody agrees that nested menus are a pain - MoonWater's are never more than two deep - but Microsoft actually discourages developers from putting direct actions on top level menus. This is a silly rule, which deserves to be broken, and MoonWater's three most common commands are right there on the main bar, where you can get at them. Since V2.1, MoonWater also offers a configurable palette of buttons with the usual indecipherable icons, but there is 'tool-tip' help on the buttons and those with suitably high resolution screens can have command labels printed on the button in a tiny font.

Of course, not even MoonWater's authors have thought of everything, but this doesn't matter because it comes with two APIs which you can use to add your own bits and pieces. The simpler just shells out to another program, passing whatever parameters you like - but even with this crude mechanism I've been able to do some nifty stuff with batch files. The more complicated one requires that you write a DLL, but this is not so hard because you will find a skeleton file and some examples on MoonWater's ftp site. There is competition among MoonWater's fans - the Moonies, we style ourselves - to see who can write the best add-on.

You would like to get hold of MoonWater? Of course there is an ftp site, which is mirrored by Demon and Imperial College for easy UK access, but there are conferences on Cix and CompuServe too, and the unwired will find that it regularly turns up on the cover disks of PC rags. It's also worth joining the MoonWater mailing list, where new versions and add-ons are announced as they are released. If you want to register MoonWater - and you should, really, although it is fully functional and never nags - you can do so online on CompuServe, or by emailing your credit card number (a PGP public key is available for the security conscious), or by contacting the UK agents, who are incidentally obliging about accepting corporate purchase orders. For US $100 you get the latest version, and a loose leaf manual designed to be easy to photocopy. For $500, you can have the source too, which is written in good ANSI C as God intended.

And now for a confession, which will not surprise the perceptive reader. There is no such program as 'MoonWater', or rather I have never encountered it. I know some excellent pieces of shareware, but even the best has no Linux version, no help on disabled menu items and one can't get the source.

If anyone has encountered a shareware package which meets my conditions, *EXE* would love to know about it, even if it has an unromantic name such as 'grep' or 'pkzip'. *(Apologies to G.O.)*

Will Watts

waNTed : friendly, reliable 32-bit OS for lasting relationship

MICROSOFT'S NEWLY released Windows 95, the mostly 32-bit successor to Windows 3.x/DOS, is well on course to become the best selling 32-bit OS ever. For developers though, Windows 95 is a mixed blessing because it is difficult to predict when it will replace Windows 3.x/DOS. Windows 95 might eventually be remembered for improving the fortunes of Microsoft's 'real' 32-bit operating system, Windows NT. Window 95 is currently introducing user interface and other usability features that are already filtering up to the architecturally superior Windows NT. If Windows 95 represents Cindy Crawford's dream-about-me looks, NT has to be Arnold Schwarzenerger with his Herculean physique.

In these early days, developers have to decide on a platform from which to target Windows 3.x, Windows 3.x with Win32s, Windows 95 and Windows NT. For me, the choice is a no brainer - any 32-bit operating system as long as it is Windows NT. Thanks to the timely release of NT 3.51, programs developed for Windows 95 will often run identically on NT. The MFC library and Win32 API are now sufficiently popular that versions or emulations exist for other platforms including MacOS, OS/2 Warp and UNIX. Microsoft's position that 'Windows NT Workstation is the most powerful desktop operating system and ideally suited to developers as well as technical, engineering, and financial users...' really translates to 'Windows NT is the real deal. Windows 95 is an interim product until 16 MB becomes the norm on the desktop.' But what is NT really like on the desktop ?.

Well, I can tell you it is a joy to use. It is fast, user friendly and solid as a rock. I have been running Windows NT Workstation 3.5 for about a year on my trusty Dan 486DX2-66 without a single crash. That is amazing when I confess that I often leave my computer running NT continuously for weeks while I develop, debug and test my programs. Under NT, programs that routinely

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humiliate Windows 3.x/DOS and Windows 95 only get as far as the End Task button in NT's Task manager. Of course this is nothing new to seasoned UNIX veterans, but it is getting easier to develop UNIX applications on NT while serious Win32 programming isn't viable on UNIX. The new NT 3.51 upgrade has something for everyone. The most significant feature is probably the inclusion of file and directory level compression on NTFS formatted drives. In use, the compression is fast, transparent and works beautifully. WinHelp 4.0 brings Full-Text Search capability to NT help files. This is great news for environment friendly developers who dislike printed manuals.

Also available, but only on the Level 2 MSDN subscription, is an alpha release of the Windows 95 shell for Windows NT 3.51. Installing the shell is child's play. Simply execute an NT command file, answer yes to the 'This is an alpha product and do you accept responsibility if it screws up...?' question and one reboot later you should be staring at Windows 95 or something similar. There really isn't much that can be said except that it works almost exactly as Windows 95, bar a few alpha bugs. To remove it, a second command file and reboot does the trick. Now you can have the look of Windows 95 and the superior architecture of NT 3.51, sort of like Arnie in drag looking a lot like Cindy. The road to Cairo has never been as beautiful.

The bottom line is: if you only develop UNIX applications you should consider one of the various UNIXes. Similarly for OS/2 Warp and MacOS. If your tastes border on the adventurous or just plain thrifty try the excellent freeware UNIX-alike Linux or its wild child Caldera from a Novell spin-off no less. Everyone else (and that means most developers) should give NT 3.51 Workstation some serious consideration. You are unlikely to be disappointed. It is fast, friendly and very reliable. Go on, give Arnie a chance.

Anthony Odutola

An ethical issue?

SOFTWARE IS PERVASIVE: from the computer on your desk to the washing machine at home, in the car, in the phone and coming soon in your wallet. But who is making the choices that are shaping our future? Who knows better than software developers the impact all new computer products will have on our everyday life; whether they will invade - or not - our privacy? There are some choices to be made now and these are not purely technological anymore, but a matter of ethics. Software developers have a duty to inform the public of what is going on: *you* have to spread the word. This was expressed by the Computer Ethics Institute, back in 1991 at their first annual conference, as the ninth of their ten commandments: 'Thou shalt think about the social consequences of the program you write'.

The Powers That Be (TPTB), ie government and industry, take decisions in their own interest. The public tends to accept these decisions where they concern software

related issues, because the issues seem too *technical* to understand and, besides, the decision makers have 'experts'. Software developers, at the forefront of the technology, can and should explain to the layman what it is all about.

Take the banking industry, which is very bullish about the security and reliability of its ATM software: all errors are customer errors. But the opposite has been proved the case in several documented instances. Surprise, surprise - how many entirely bug-free programs do you know? But the naïvety of some people is such that they believe printed output, simply because it comes out of a computer! Nobody is better placed to correct this view than the software developer.

One area not generally well understood outside technical circles is the issue of the state's need to protect itself versus the individual's right to privacy. To the lay person, this appears to be a trade-off: the extent to which you have one limits the extent to which you can have the other. The address and personal details on, say, a driving licence, are vulnerable to abuse by TPTB. Why put all these details on a *driving* licence, what have these to do with the fact that you can or cannot drive a vehicle? Most authorisation processes today are based on the physical identification of the authorised person. Is there really such a need? Recent advances in cryptographic technology have allowed the separation of the identification and authentication processes. It is now technically feasible to have a smart card containing the information describing what type of vehicles you are allowed to drive but no personal information. To read and validate the information, a cryptographic key would have to be entered by *you*.

The combination of smart cards and cryptography has many applications, but decisions must be taken now if we do not want TPTB to control everything in our life. The Department of Transport is experimenting with schemes for automatic motorway tolls. Will these toll devices, affixed to vehicles, be identifiable? They don't need to be to perform the job of collecting tolls.

Yet some governments have already opted for schemes which identify the driver. In Norway, for example, you can buy a small gadget that is fitted to your car and which pays tolls automatically. This device identifies your car uniquely, so the system could easily be modified to include detection of drivers breaking the speed limit, causing a ticket to be dispatched without human intervention. It will be easy to find the right address: every Norwegian citizen already has a unique number, issued at birth, which is then used in every state controlled database. Software developers are involved right at the beginning of such projects, and are key people since the software is controlling the whole project. They are the only persons that can, and must, inform the public at the start.

Somebody's program, somewhere, is watching you. Developers wake up to your duty and spread the word...

David Mery

Yield a sigh

THIS NUMBER OF *EXE* marks my last as Editor-at-Large. My contractual obligations being fulfilled, I am retiring to spend more time with my Crystal Reports tech support, although I hope to continue to pop up in these pages from time to time. Thanks to the many folks - especially in our Production Department - who have made my second *EXE* stint successful and enjoyable. (Well, for me, anyway.)

David Mery has been appointed Editor from the November issue. David has been doing all the hard editorial work these last six months, while I have simply pitched up one day a week to take the credit. I can't think of a safer pair of hands to hold 'my' baby. I wish him the best of luck with the exercise.

Since I seem to have some column-centimetres in hand, I'd like to quote a favourite poem by Humbert Wolfe. Oh, don't make a face like that, it's very short:

You cannot hope to bribe or twist
Thank God! The British journalist.
But seeing what that man will do
Unbribed, there's no occasion to.

David is French.

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CIRCLE NO. 333

Mayhem!

Jules got such a fright when he looked behind his computer and saw a truly horrible sight. Dead rats? Oxide from his disks? Three inches of dust? No, he found miles of wire. Why was he surprised?

There are certain things in the world which keep secrets from mere humans. Only a ballpoint pen knows where it goes when you want it. Only the washing machine knows why left socks taste better than right socks. And I don't suppose anyone knows why all physical constants can become variables during the demonstration.

But there's one secret in particular that I want to write about now, and that's the secret known only to wire. It doesn't matter how carefully one lays out and coils wire behind pieces of machinery. It doesn't matter how immobile the equipment the wire connects is. When you come to remove the wire, you're faced with a horrible, snarly mess. You unplug one end, you unplug the other, you pull, and a rigid lump of spaghetti moves. You can thread and unthread until Hell freezes over, and you'll never untie it not even after the connectors have dropped off the end and the wire is effectively useless. The only way to get that wire out is to remove every single connector, or to cut it.

After considerable research, I've discovered something which everyone who uses wire is aware of: that a piece of wire can break itself, step past another wire, and rejoin itself without leaving any evidence at all, and that wires in close proximity do this at random intervals. From fixed installations behind computers to temporary rigs on stage, every wire does this, and most people simply resign themselves to the fact that this is probably the most lamentable intrinsic property of wire.

In fact, though it's an intrinsic property, it's not lamentable at all. Wire does one thing very well: it conducts stuff - signals, power, whatever - from one point to another. Any piece of wire has two and exactly two ends. You plug one end of a connector in to one place, and the other end in to another, and no matter how big or complex the connector, no matter how tangled or tortured the route between them, you know that the two places are now irrevocably connected. A signal going in one end of the cable must come out of the other because there's nowhere else for it to go.

Another property of wire is that, to use a programming term, it's strongly typed. Though I can cast this video connector into an RS232, it's not only very difficult, it's probably futile. For real purposes, there's only one place where I can plug this video cable, and that's a video-cable-shaped hole.

Occasionally, this does create problems. If a signal has to arrive at several different places, you need several bits of wire, you need hubs, distribution amps and switches to separate the signal. If several signals are arriving at the same place, you need multiplexers too. But, by and large, wire does the job asked of it very well indeed.

Ah, but what about LANs, I hear you ask. LANs represent something quite different, where all kinds of people can connect all over the place. LANs are more like buses. Inside a computer, the various buses are designed with very simple and very predictable modes of access, and they still don't allow much messing. Actually, LANs can be problematic, and that's probably one of the reasons that they're so difficult to get working. As a science, we know a lot about two-ended wire, and about connections using that model. LANs are pointing towards a different kind of problem.

The real problem is illustrated by portable machines. Increasingly, a portable machine which can't talk to anything is a waste of electricity, but you can't expect a poor user to grapple with hundreds of wires every time he arrives at or departs from his desk. The most practical proposition so far is to place all the cables into a desk station, and dock the portable into that - in effect, make the connection from the desk to the portable out of a single wire, too small a number to get tangled with anything. That way, the desk station can make the LAN connections. But this solution won't last long; a group of people in a meeting may well want to connect their machines, and short of designing universal docking stations into every desk, wire will never accomplish that.

The core problem for computer designers, even now, is building in connectivity. The connectivity problem in portables is fearsome, but as computers increasingly break free of their desks (as they must), and hit the road along with 'phones, faxes, and all the other accoutrements of modern life, they must be able to talk without wire. Your machine must be prepared to talk to my in-car printer without fumbling with the lighter socket, and without competing with my machine talking to the same printer.

We know how to carry data through a radio link, or through infrared, or even through the cellular network. But, to simplify the engineering, all these approaches now simulate wire - you dial another specific number on your cellphone, or you use one remote control at a time. We have no real science of multiway conversations on a single channel. The closest we do have, the bus, is not really suitable for conversations where participants are entering and leaving the conversation dynamically, or where a contribution must make two or three hops to reach all of its destinations.

This is a problem which must be solved, and solved before too long, if computers are to go on the move. Unfortunately, proprietary solutions will be next to useless; if a Loganberry computer tries to join a conversation between two Buddies, it must be *able* to join in, and it certainly mustn't wreck any conversation which is already going on. I don't often say this, but we need comprehensive standards, probably burned into chips, before this technology will take off. How, though, can we figure out what those standards should be until we've tried it in the large and seen what the problems are?

I suspect we'll just have to accept that whatever standard does emerge will be less than ideal, and the PC has shown we can live with less-than-ideal for a few years. We've got bits of technology around already which can be adapted to help - bits of LANs, bits of Internet, bits of echonets, all of which have been extensively tested in the large. Someone, somewhere is going to have to take a big chance. But the rewards if they get the right mix - complete control of computer interconnectivity - will be worth it. ■

Though he'd very much like to throw away all his wire, right now wire is the only way you can contact him. Jules@cix.compulink.co.uk will probably work, as should 01707 662698.

Visual tools

On September 12th, Microsoft organised its biggest event for software developers in the UK. Called Visual Tools, it was a conference where no less than eight products were announced: Visual Basic 4.0 Standard, Professional and Enterprise editions (see review in the Visual Programming supplement), Visual C++ 4.0 (see review p. 20), MSDN Level 3, Visual SourceSafe 4.0, Visual Test 4.0, Fortran90 4.0, Access Developer Kit 7.0, and Visual FoxPro 3.0 (again!). All in all, 3000 developers attended. It was nice to meet some of our readers face-to-face at the EXE/EXplodE stand.

Standard Parallel C++

The European Union-funded EUROPA Working Group, which has been carrying out work on a draft standard for parallel C++ over the past year, is to describe the outcome at a one-day meeting in Brussels in November. More information about the EUROPA Working Group and the draft standard can be found at http://www.lpac.ac.uk/europa. To find out about the meeting in Brussels, email M.Holford@lpac.ac.uk, or telephone The London Parallel Applications Centre on 0171 975 5315.

OMG request proposals

The Object Management Group (OMG) last month announced a Request for Proposal for Object Request Broker (ORB) Enhanced Portability, plus a Request for Comment on an Ada '95 mapping for CORBA's Interface Definition Language. In addition, the OMG is inviting proposals for three Object Services: a Startup Service, a Collections Service and an Object Trader Service. Comments and proposals are welcome from OMG members and non-members. Call Geoff Speare on 001 508 820 4300 for submission deadlines.

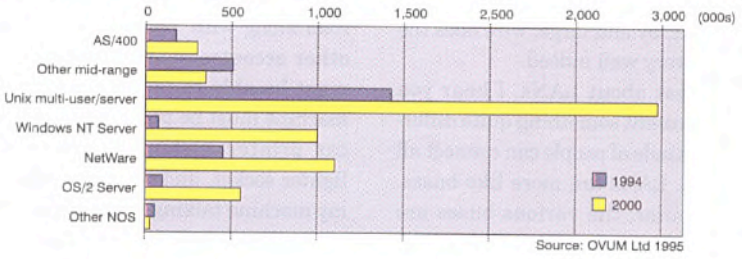
Free Quidnunc guides

Running Software Projects, from computer consultancy Quidnunc, is a 32-page booklet containing insights reaped from over 150 projects designed to help IT professionals recognised *patterns* - development situations that arise again and again - and deal with them. Quidnunc has also published *The Definitive Guide to Client/Server*, which contains a synthesis of the mainframe vs. PC debate, analyses of the latest models of client/server architectures, tools listings, and more. Both these publications are available free for a limited period - call Vicky Daniels on 0181 741 7117 to order.

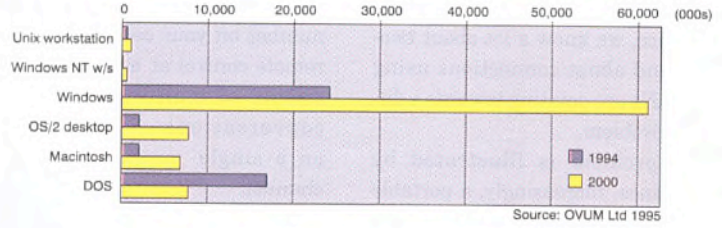
NT a server OS?

Ovum, the market research company, forecasts a compound growth rate of 52% for Windows NT Server. If this growth rate is sustained, NT Server should reach just over 1 million units in Europe by the year 2000 putting it as the 'fastest growing server OS in the European market'. To achieve such a result, especially compared to NetWare, the current market leader for Network Operating Systems (NOS), NT will need to 're-define the NOS market'. What Ovum means is that Microsoft will have to convince LAN users that a general purpose OS, ie NT, is better than a network specific one, ie NetWare, even for NOS functionality.

NetWare will be directly affected by NT Server, but according to Ovum, the European Unix market should not be affected - at least in the short term. In the longer term, the competition of NT might lead to a price war in the Unix market.



Installed base of servers by primary OS in Europe



Installed base of desktop systems by primary OS in Europe

Although the future of NT Server is bright, NT Workstation's looks more gloomy. Its biggest competitor is another Microsoft's product: Windows 95. Microsoft's marketing has been successful in convincing users that Windows 95 is a Windows 3.x upgrade and not yet another OS. In doing so, Microsoft has positioned it as the logical evolution path for all the Windows 3.x user base. A more detailed analysis of Ovum market forecasts can be found in *Operating Systems: Markets & Futures* by Heather Stark. The report costs £725 and can be obtained from Ovum (tel: 0171 2552670, email: info@ovum.mhs.compuserve.com).

Bugs, plugs and static testing

Automated code inspection specialist Programming Research Ltd predicts that the next generation of consumer electronics is at risk from that denizen of even the most humble of programs - the bug. As present, the amount of code in consumer products is doubling every two years: the latest large-screen television has more than 200,000 lines of embedded code.

The problem is this: while it's perfectly acceptable today for a person's word processor to crash every week or two, that same person will not accept similar run-time behaviour from the software in their television. 'TVs, radios, even cars, now incorporate so much software that we are starting to see the consumer electronics industry inherit the same problems the computer industry has been struggling with for years', said Paul Blundell, Managing Director of Programming Research.

Blundell went on to estimate an error rate of approximately one bug per 55 lines of executable C code, and further claimed that up to 40% of those errors should be statically detectable. Static inspection, which highlights likely faults or inconsistencies prior to any run-time testing, is an important way of increasing the reliability of large, safety- or mission-critical programs.

For more information on Programming Research and its quality assurance static testing toolkits, call 01932 888080.

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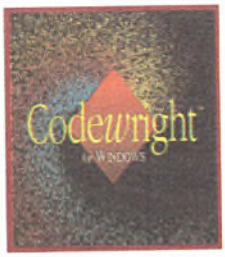

CodeWright Professional 3.1 - Programmer's Editor

CodeWright is a professional quality programmer's editor designed to greatly increase code editing efficiency and provide powerful programming benefits for Windows based development. With emulation for both CUA and Brief, Code-wright supports C/C++, Assembly, xBase, Pascal. Key features include Tabbed Output Window, VDOS Command Shell, Help Indexer, User Defined ChromaCoding, and File Based Search and Replace. Available for Windows or Windows NT/95. £159

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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.

BoundsChecker Professional

BoundsChecker Professional redefines automatic error detection for C/C++ developers using Windows 95 and Windows NT. Professional Edition introduces breakthrough technologies to capture even more information, with extended API compliance checking for all three Win32 implementations. Integration into the VC++ environment, enables BoundsChecker to be used at all stages of development.

WatcomC/C++ version 10.5

Watcom C/C++ delivers a professional, cross-platform 16-bit and 32-bit development system that produces the fastest executables for the widest range of platforms. Using the same integrated development environment, you can target all platforms including Windows NT, Windows 95, Windows 3.x, OS/2 Warp, extended DOS and more. New features include: Blue Sky's Visual Programmer, Windows 95 Ready, MFC 3.0 for Win32 and direct support for popular revision control packages. Special offer only £139

MKS Toolkit ver 4.4

MKS Toolkit gives Windows NT3.5+ and Windows 95 developers a full suite of powerful UNIX tools including KornShell, awk, awkc, vi and visual diff for Windows, make, a windows scheduler, grep, sed, tar, cpio, and pax - more than 190 commands and utilities for customizing your development environment and performing a variety of computing tasks. MKS Tookit supports NT long filenames and permissions. All utilities are 32 bit, for extra performance.

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Softwaire copyrite

The one-page Computer Law Bulletin, issued by Bird Semple, reminds developers of a few common misconceptions such as 'change a few lines of code and you will not infringe copyright in the original source code'. In a recent case where one developer wrote two applications for two competing companies, the judge ruled there was copyright infringement, on the basis that the same *spelling mistakes* occurred and much of the coding was similar. Copyright infringements are judged not only on 'literal similarities' but also on the similitude of 'program structures' and 'design features'. Bird Semple is on 0131 4592345.

MSDN goes to Level 3

Microsoft will start shipping Level 3 of its Microsoft Developer Network (MSDN) in October. Level 3 is a superset of Level 2 targeted at BackOffice developers. Level 1 consists of a quarterly CD-ROM containing up-to-date technical information; Level 2 adds the latest versions of Windows and NT Workstation, as well as SDKs and DDKs. Level 3 will also include the BackOffice Test Platform (NT Server, SQL Server, SNA Server connectivity, SMS and Mail Server) and off-cycle 'important' releases such as the Exchange Server. Subscription costs £745 until the end of the year. The Microsoft Subscription Centre is on 0800 960279.

DOCA revealed

System Software Associates (SSA) has published details of its object-oriented architecture known as the Distributed Object Computing Architecture (DOCA). The deployment environment of SSA is message-based and conforms to the Common Object Request Broker Architecture (CORBA). The details can be found in a new publication entitled *BPCS Client/Server Distributed Object Computing Architecture*, available directly from SSA for £20. To order, call 01276 692111. SSA's Web site is at http://www.ssax.com.

DCE beta programme

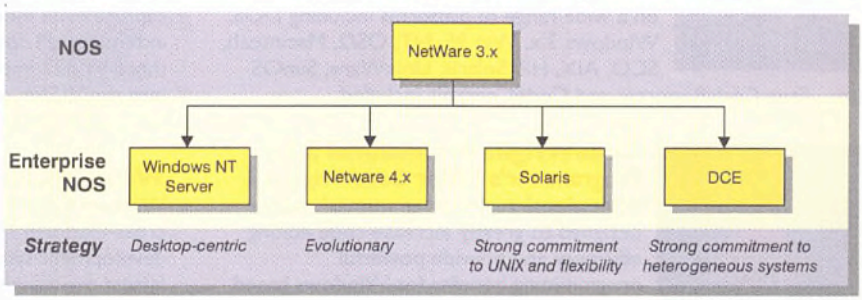
IBM is looking for beta testers for its OS/2 Warp Distributed Computing Environment (DCE) 2.1. The beta programme is aimed at developers focusing on distributed computing technologies. IBM DCE 2.1 for OS/2 Warp supports the new functions of OSF/DCE version 1.1 and some proprietary extensions. For more information, or to enter the programme, point your Web browser to http://www.ibm.com.

Network Operating Systems go for the Enterprise

US market analyst DH Brown Associates has released a report titled *Reliable Information & Transaction Systems*, which states that there's a need to move from Network Operating Systems (NOSs) to Enterprise NOSs, or ENOSs. A traditional NOS's strength is in providing shared file access. An ENOS must also support database processing, messaging, communication, host connectivity and distributed management. It must also be able to integrate all network servers into a general information system.

The report focuses on four contenders: OSF's Distributed Computing Environment (DCE) 1.1, Novell's NetWare 4.1, Sun's Solaris 2.4 and Microsoft's NT Server 3.5. DCE is the only one of the four systems not to be an OS: it's a comprehensive set of distributed services which sit on top of an OS such as Unix or Windows.

Solaris is considered as the one system meeting all requirements for an ENOS. The second place is contended for by DCE and NT. DCE lacks support for printer sharing; NT lacks a global directory service. Also, both NT and DCE are too new technologies to have a proven track record of performance and scalability. NetWare lacks the ability to support applications both 'robustly and efficiently'. Novell has announced that it will merge NetWare and UnixWare, but the result might come too late for Novell to keep its leading position.



Source: DH Brown Associates

NOS migration strategies

The report covers in detail all aspects of these four NOSs. As far as development tools go, once again Solaris (rated 9 on a scale of 1 to 10) came in first place, followed by NT (rated 8.5). Solaris' strong point is its tools for the development of large software projects, whereas NT is more focused towards individual programmers.

DH Brown Associates is on 001 914 937 4302 extension 225 (email: simon@dhbrown.com).

ODBC - faster than you think

The commonly-held belief that Open Database Connectivity (ODBC) is slow may turn out to have little foundation, suggests a report by the independent consultancy Resource Group. The report, which will be released in its complete form later in the year, describes the results of 29 tests comparing typical SQL queries done with both native APIs and the ODBC API.

ODBC, a specification published by Microsoft that allows database programmers to write to a vendor-neutral API, has often been criticised for incurring a large time overhead. Resource Group's tests were carried out with APIBench, a suite of benchmark tests which performs common database transactions. The performance of Intersolv's ODBC drivers was compared with native APIs for Oracle 7, Informix 5 and Sybase System 10, on Intel and RISC processors running NetWare, Windows, OS/2 and Solaris.

In the tests, ODBC code performed 17 of the tests in *less* time than the corresponding software written with a native database API - averaging 10% faster or more in 8 of those. Of the other 12 tests, where ODBC was found to be slower, only two showed native performance to be as much as 10% faster.

When the report is released, the C source code for the APIBench tests will be posted to the libraries of the Intersolv and ODBC forums on CompuServe. In the meantime, an Executive Summary of the report is available now from the same forums and from Intersolv's Home Page at http://www.intersolv.com/.

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JumpStart to CommonPoint

After releasing the object-oriented application framework CommonPoint for the AIX platform in July, IBM announced last month a 'JumpStart' beta programme for OS/2 developers. Members will be sent beta code of the CommonPoint Application System for OS/2 and a Development Toolkit. Also on the cards, according to Taligent, the developers of CommonPoint, is a Windows NT port. This will be the first non-investor OS to host CommonPoint (Taligent's investors are Apple, Hewlett-Packard and IBM). To find out more about Taligent call Andreas Kyriakou on 001 408 7775093.

Mathematical objects

Visual Numerics has released the first set of objects of its Object Suite for C++. The mathematical module will be joined in 1996 by optimisation, signal processing and graph modules. Visual Numerics has completely re-architected its libraries while moving from Fortran to C and from C to C++. The objects are sold in binary form for platforms ranging from Windows 3.1 and NT to Solaris and HP-UX. ISM Math Module for C++ costs £695 and is available from Visual Numerics (01753 790600).

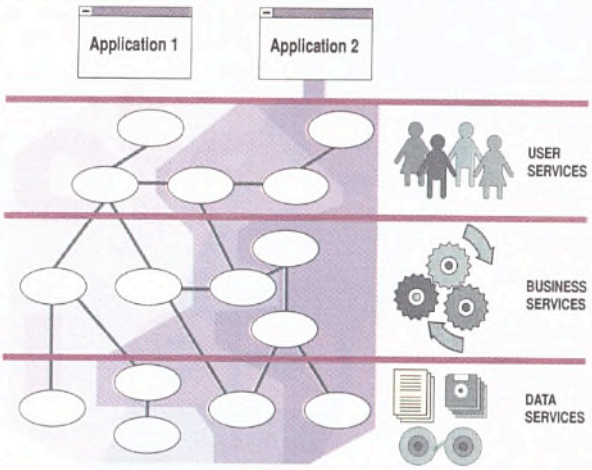
How safe is your source?

Visual SourceSafe 4.0, the successor to Microsoft's Delta version control system, was unveiled last month. The project-based source-code management tool for Windows integrates with both Visual C++ 4.0 and Visual Basic 4.0 (see the reviews in this issue and in the Visual Programming supplement). To coincide (roughly) with the launch, California-based company MainSoft has 'rehosted' the tool onto various Unix platforms, including Solaris, AIX and HP-UX. For more information on the Unix releases call Personal Workstation Software on 0171 231 0333.

Reverse engineering

A new tool from Interactive Development Environments promises to simplify the maintenance of legacy systems. StP/RevC reverse-engineers existing C source code into structure charts, data structures and control flow charts, which can then be analysed, modified and re-engineered back into code. The product creates a repository model compatible with IDE's StP/SE structured analysis and design tool. StP/RevC is priced at £7,500, and runs on Sun platforms with a HP-UX version due in November. Call 01483 579000 for details.

Distributed OLE with NextStep



The next major release of Windows NT, code-named Cairo, purports to enable *Remote* OLE Automation - distributed OLE objects that can communicate across a network. NeXT, which has just announced a port of its entire object-oriented product suite to 32-bit Windows, has beaten Microsoft to it.

Distributed OLE for Windows (D'OLE), which extends NeXT's Universal Object Request Broker to support the OLE object model, allows programmers to create Windows NT applications that message remote OpenStep PDO (Portable Distributed Objects) objects via an OLE Automation interface. Any OLE Automation-enabled application will be able to use distributed OpenStep objects. NeXT has also announced that version 4.0 of the PDO object model will comply with CORBA 2.0, meaning there will soon be full interoperability between OpenStep, OLE and CORBA objects. D'OLE 1.0 for Windows NT should be available in the fourth quarter of this year, with a follow-up release adding support for Windows 95.

OpenStep itself, NeXT's development environment that supports the PDO dynamic object model, is also scheduled to be released for Windows 95 and NT. Using OpenStep 4.0, developers will be able to create NT-hosted PDO server objects. The PDO objects are portable across any OpenStep platform, including Digital UNIX, SunOS, Solaris and HP-UX, although the location of the server is transparent to the NT client.

The other product to be released for Windows is NeXT's database framework, Enterprise Objects Framework for Windows, which integrates OO applications with persistent data stored in relational databases. Collectively NeXT's technologies enable applications to be distributed across a three-tiered architecture of clients, application servers and database servers (see diagram).

More information can be obtained from NeXT, tel. 0181 565 0005.

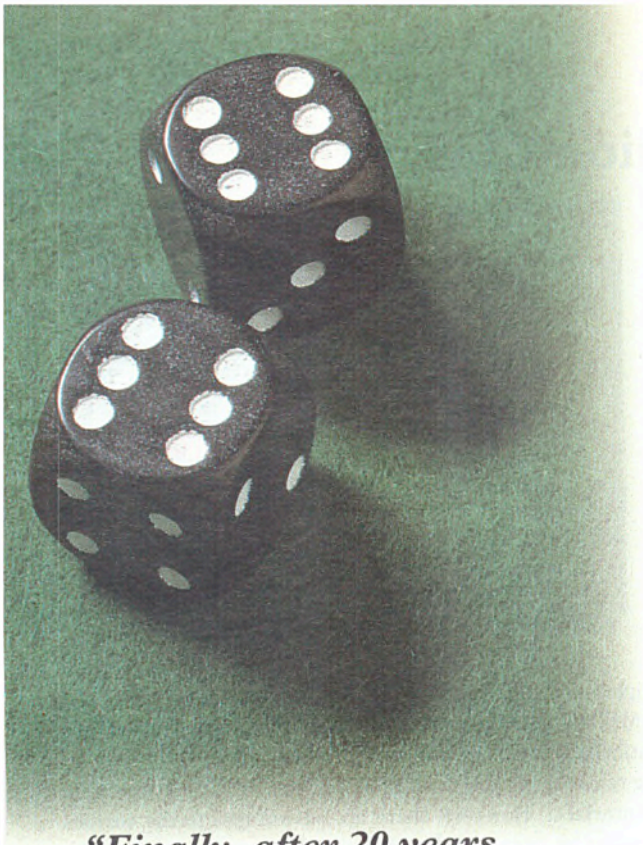
OS/2 up to Warp speed

Beta testing of OS/2 Warp Server, IBM's follow-up to its OS/2 Warp Connect network client, has started. The new operating system is being targeted at businesses, ranging from small companies with simple file and print server requirements to large enterprises wishing to run high-end server applications.

OS/2 Warp Server combines the 32-bit multitasking capabilities of OS/2 Warp Connect with the network server features of LAN Server 4.0, such as its drag-and-drop administration model. Also included is a GUI-based utility for migrating NetWare 2.x and 3.x users and other system information to OS/2 Warp Server. Networking capabilities include a software and hardware 'discovery' feature which will give system administrators the ability to identify remotely the components of each workstation on the network, gleaning such information as the version number of programs and the type of hard disks.

With a variety of other enhancements, like its built-in remote access (plus the ability to control a user's computer remotely) and a backup facility compatible with IBM's Automated Data Storage Management (ADSM), OS/2 Warp Server is clearly intended to compete on equal terms with other business-critical operating systems like Windows NT.

Clients supported by Warp Server include MS-DOS, Windows 3.x, 95 and NT, Macintosh, and of course OS/2 Warp and Warp Connect. The product should be released in the first quarter of 1996. Pricing has yet to be determined - there'll be an upgrade program for existing LAN Server users. For information, peruse IBM's Home Page at http://www.ibm.com, or telephone 01329 242728.



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✎ CIRCLE NO. 336

Mega new BoundsChecker

Nu-Mega's debugging tool BoundsChecker is now available in a Professional Edition for 32-bit Windows. A new technology - Compile-time Instrumentation - from Nu-Mega's partner ParaSoft automatically inserts error-checking code into your executable that allows BoundsChecker to check the use of every pointer in your program. The US price is $999, or $499 before the end of 1995. Call Grey Matter on 01364 654100 for UK availability.

Symantec C++ 7.2

Version 7.2 of Symantec's C++ compiler, an upgrade release to match the final build of Windows 95, is now available at £409 (£159 competitive upgrade). The release ships with MFC 3.2, which includes support for Windows 95 controls. Free upgrades should automatically be sent to registered users of 7.0 - if yours doesn't arrive, you can chase Symantec on 0800 526456.

CA-Clipper 5.3

Computer Associates has begun shipping version 5.3 of its CA-Clipper xBASE development tool. The product now includes a Windows-based 'workbench' for the visual development of DOS applications, which CA hopes will serve as a stepping stone for programmers moving towards Windows and CA-Visual Objects. CA-Clipper 5.3 costs £595 (£175 upgrade). Call 01753 577733 for details.

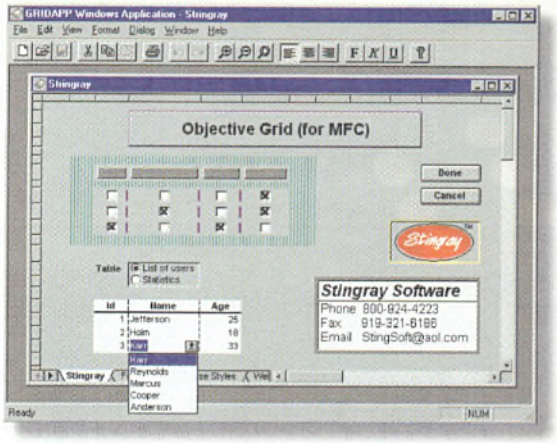
Progressive JPEG

Pegasus Imaging has released the second beta of RapidVue, which allows progressive viewing of JPEG image files. Pegasus claims that it creates smaller and higher quality files than other implementations. The final toolkits should be ready at the end of October, for Windows platforms, OS/2, DOS, and Mac OS. RapidVue is distributed in the UK by Orion (01633 868811). You can also check out the URL http://jpg.com.

CORBA 2.0 with Smalltalk

Hewlett-Packard has rolled out the latest release of Distributed Smalltalk, version 5.0, which conforms to the Common Object Request Broker Architecture (CORBA) 2.0 specification. By conforming to CORBA 2.0, HP Distributed Smalltalk eliminates the need for developers to write their own messaging middleware. With the package comes HP's Interface Definition Language (IDL) Generator, which automatically creates the IDL interfaces for user objects. To find out more call HP on 01344 369231, or visit http://hp.com.

MFC Extension Classes



Two new Microsoft Foundation Classes (MFC) extension libraries from North Carolina-based Stingray Software ship this month. MFC++ 1.0 complements and extends existing MFC classes; Objective Grid 1.0 is an ODBC-enabled grid control.

For the uninitiated, MFC extension libraries, or AFXDLLs, are a special format of dynamic-link library (DLL) introduced by Microsoft with Visual C++ 2.0. As they use a C++ (rather than C) interface, they can be called straightforwardly from C++ code without relying on tricks like explicitly passing `this` pointers. MFC++ and Objective Grid 1.0, like MFC, are supplied with full source code and so may be statically linked in or compiled into AFXDLLs.

With many libraries now being released as OLE Custom eXtensions (OCXs), it may seem odd to hark back to a DLL-like interface. However, there are advantages to the various approaches. OLE 'objects', employing an open interface between binary objects, have the advantage of not being language-specific, but may not be integrated at the source-code level and so can't utilise object-oriented features such as inheritance. Traditional DLLs have a C language interface and so may only be called from a development environment that supports calling C libraries, such as a C compiler or Visual Basic. On the plus side, they don't require the programmer to learn a new API and have little run-time/load-time overhead. Finally, MFC extension DLLs, as described above, are similar to DLLs but can (and may only) be called from C++.

MFC++ 1.0 extends MFC's functionality, adding zooming and panning classes, image classes, new GUI components, and 'thumbnail' (file preview) support. Also provided are classes that implement alternatives to MDI (Multiple Document Interface), which Microsoft is currently migrating away from. MTI (Multiple Top-level Interface) creates a new top-level window for each document, an approach common in OSF/Motif; WDI (Workbook Document Interface) is an Excel-style tabbed set of documents. MFC++ 1.0 provides classes to enable MTI or WDI in your applications.

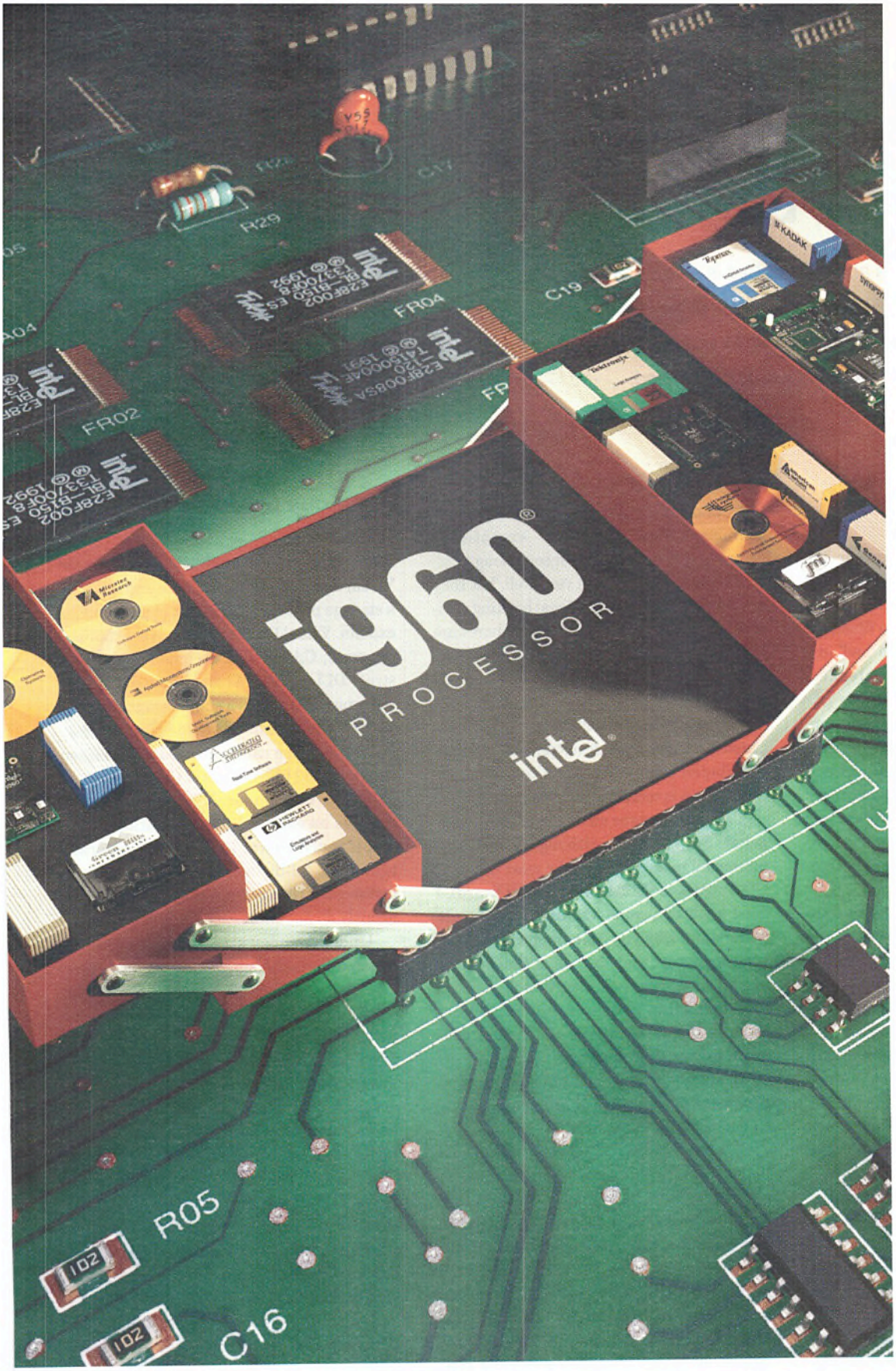
Prices are $495 for MFC++, $395 for Objective Grid, or $795 for both. Stingray Software's Home Page is at http://www.unx.com/~stingray; alternatively, ring 001 919 3216186 for more information.

Open M for NT

InterSystems has started to ship an NT version of Open M, its RDBMS and development environment based on M Technology. M is an ANSI and ISO standard derived from MUMPS. Its requirements are low, little more than what is necessary to run the OS, but performance is supposedly excellent. InterSystems gives an example of a Boston hospital, with 5,000 users and 40 servers all running Open M under DOS, and more than 100 applications. With a load of about 3,000 simultaneous users, the response time is on average sub-second and at worse 3 seconds.

When MUMPS started it comprised a language, a database and an OS. Today, M Technology consists only of a language and a database system. It runs on many operating systems and can also access other databases, such as SQL Level 2. Open M can run in several types of configuration: on servers, on clients, or on both. When it is deployed on both clients and servers, the application can be partitioned to run partly on both machines. For Windows platforms, InterSystems also provides Visual M a combination of M and Visual Basic, the latter being used as a RAD tool for M.

Open M for NT in single-user configuration costs £140. Prices start at £605 for multi-user and £710 for client/server systems. InterSystems can be reached on 01753 855450.



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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.

Changeless languages

Dear Sir,

Francis Glassborow (*EXE* September '95) makes a valid point about the difficulty of changing standardised languages and provides an apt 'bad' code example to illustrate it. Unfortunately, the code is also 'bad' in a way that Francis surely never intended. Like countless others before him, he has fallen prey to one of the all-time great language design gaffes, namely K&R's decision to restrict the = operator to assignment and provide another operator for its intuitive meaning of logical equality. This always was arsy-versy, given that no standard keyword symbol has the intuitive meaning of assignment.

The errors this gaffe causes are so common that all modern C implementations issue compile-time warnings about unintended assignment. Given that the compiler is already checking the context of the =, there's no sensible reason for not having a dual purpose assignment/equality =. Many languages (xBASE, to name but a few) do just that.

I had hoped that ANSI C might sort this, but it was not to be. Is there still some hope for it in Standard C++?

Robert Sproat
London, N6

Fair point on C's usage of = and ==. But, in this example, the assignment is correct. The variable `my_order` holds the result of each successive comparison of characters in the two strings. The test works by evaluating `my_order` after it has been assigned to, and checking whether it is true (non-zero) or false (zero). The loop will terminate on the first different character in the strings - Ed.

Smalltalk

Dear Sir,

I was wondering why your coverage of Smalltalk was so limited.

I suspect many of your readers work in the City, and mildly proficient Smalltalk programmers can command exceptional salaries, which would be reason enough.

Delphi and VB are all very well, but they are not used within professional banking environments for anything else than toy shareware GUI programs, because they are proprietary, because they are not portable, and because they are not suited to big team projects.

Moreover they are unlikely ever to be associated with advanced developments, such as distributed computing, and their database friendliness is comparatively limited.

I am by no means an OO/Smalltalk evangelist. For instance, although I would be interested in an article on the most OO of all OO languages (Eiffel, or so I have heard), I don't know of anyone who uses it, so I quite understand why you never mention it. Also, you may retort that the use of Smalltalk is much less widespread than C or C++. However it is often used in conjunction with them in big applications, and its use goes much beyond GUI design.

In summary C++ & Smalltalk are what professional people use or are moving to. So let's hear about them both!

Allen
Internet address supplied

Smalltalk coverage has been limited in the past for the main reason that we have received very few requests for articles on this language. Even so, we do plan to publish articles on Smalltalk. Also the theme for the February '96 issue is object-oriented languages.

One very interesting aspect of Smalltalk is that both its inception and the choices made in early implemtations have been completely documented in a series of books.

***EXE* has published several articles on Eiffel in the past. We even interviewed its inventor, Bertrand Meyer, back in May '92. - Ed.**

A curious phenomenon

Dear Sir

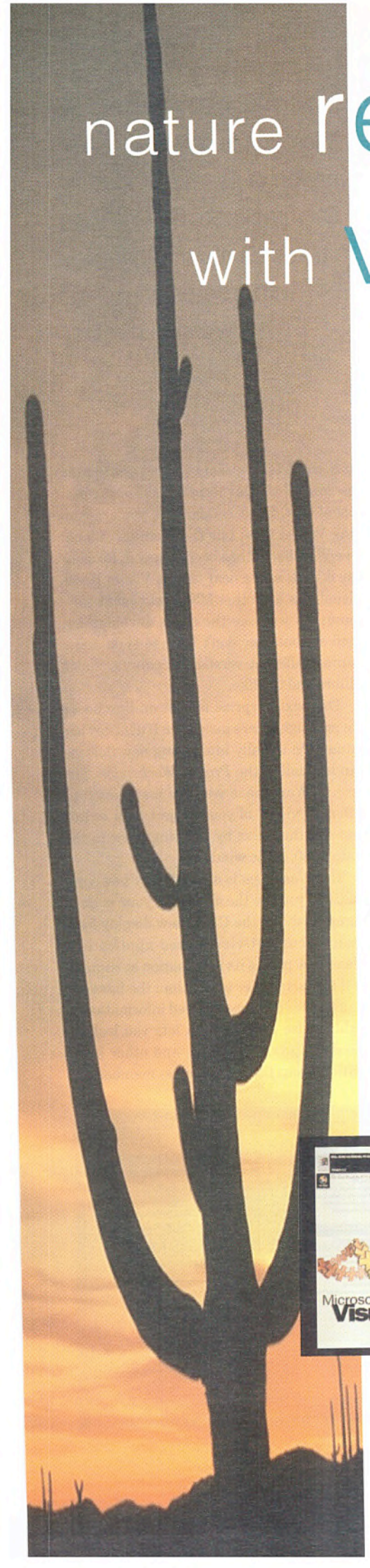
While experimenting with Microsoft's new Visual Basic 4.0 package, I have encountered a strange phenomenon which I am unable to explain. Visual Basic comes with an example program, CALLDLL, designed to demonstrate DLL calling. When compiled and run, the program displays a simple animation of a ball bouncing around inside the window. This application can be created using either the 16 and 32 bit versions of the compiler.

When run under NT, this program behaves as expected: the animation of the ball is much slower in the 16-bit program than the 32-bit version, and multiple instances of the program executing simultaneously do not affect each other.

Under Windows 95, the situation is rather different. A single instance of the program, either 16 or 32-bit, executes rather slowly - my impression is that the execution speed is about the same as the 16-bit program under NT, although I have not verified this with scientific comparisons on the same machine. Two instances - and it appears to work with *any* combination of 16 and 32-bit EXEs - execute much faster; I guess three times as fast. The speed up occurs as soon as the second copy of the program is loaded - one does not even have to press the button to start the animation. Closing either of the instances causes the remaining program to drop back to its former speed.

I cannot think of any explanation for this behaviour. One would expect the second program to load more quickly, since the DLL it calls is already present in memory, but this does not explain the observed behaviour. A colleague facetiously suggested that it proved what a wonderful operating system Windows 95 is, since the more programs it has to run, the faster it goes. Perhaps one of your readers can furnish me with a more likely explanation.

Simon Forest
Leicester



nature reuses patterns!

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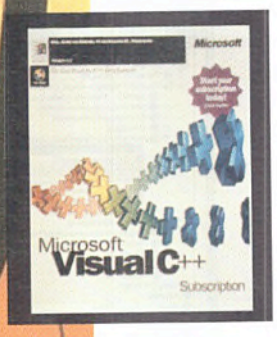

Introducing Visual C++

Microsoft Visual C++ 4.0 offers enhancements to re-usability, such as the pre-built objects in the Component Gallery, the updated and enchanced MFC for the latest library of pre-written code, and OLE controls that can be shared across applications in different languages - to enable you to pack more features into your application in less time.

MS Visual C++ 4.0 includes full-support for Windows 95 controls and the new Jet Engine 3.0 with data access objects provides fast database support. The new Class View feature enables simplified management of projects as sets of objects, instead of a collection of files. Visual C++ 4.0 integrates with MS Visual SourceSafe for secure team development.

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CIRCLE NO. 338

Visual C++ 4.0 Magical Mystery Tour

Along with all the other Windows 95 bits, Microsoft is shipping a new version of its market leading C++ package. **Scot Wingo** takes us round a package with a surprisingly high version number.

With the advent of the Microsoft Visual C++ subscription, it seems like you receive a new Visual C++ release almost daily. Once you've installed the new release it takes a couple of hours to locate the one or two new features and then realise that they probably were not worth your time spent installing.

This is not the case with Visual C++ 4.0. After you install the product and fire it up, the biggest question is...

What isn't new?

There are only a handful of Visual C++ elements that have not undergone major revisions. Unfortunately, the browser has not improved at all. Some of the resource editors, like the bitmap editor and the stringtable editor, have not changed either. AppWizard and ClassWizard are relatively unchanged, except for a new popup menu button. Other than that, everything has either been completely remodelled or at least had a good dusting.

Another burning question you might reasonably ask is: why did Microsoft skip from 2.2 all the way to version 4.0? The 'official' reason is to synchronise the version numbers of MFC and Visual C++, which have been one off from each other for years and caused a great deal of confusion. One Microsoft Product Manager recently quipped, 'A left shift is faster than an add,' when asked about the skip.

Let's take a tour of what's new by looking first at the VC++ 4.0 Integrated Development Environment (IDE), then MFC 4.0 and finally, for all you linguists, the C++ compiler. As your tour guide, I will try and point out the highlights and the tourist traps.

A disclaimer: this article was based on a early beta of the product and some of the product features were still fluctuating. I have done my best to present the features as they will be in the final shipping product, but hey, this is Microsoft, you never really know what they will do.

Windows 95 trinkets

Since Visual C++ 4.0 is one of the first development tools to come out after the official shipment of Windows 95, it makes heavy use of Windows 95 features such as the Explorer-like common dialogs and the Windows Common Controls. Those are the features that we all expected, and are probably getting tired of hearing about. So this tour focuses on the changes to Visual C++ that will most affect the way you use Visual C++ in your day-to-day C++ code writing.

When you start up Visual C++ 4.0 there's a brief moment of shock as you realise that just about everything in the environment you have been using for the last months has changed and looks completely different. See Figure 1.

First, the splash screen says that you started the Microsoft Developer Studio and not Visual C++. Don't be alarmed, you *are* running Visual C++, but the moniker 'Visual C++ Workbench' has been dropped. Rumour has it that, in the near future, Visual Basic, Visual C++ and other MS development environments will use the same development shell so that they don't have to keep maintaining different versions of editors, dialog editors and the like.

The next surprise is that on-line books are now right there inside the IDE. They are actually in a really interesting new floating window called the *Project Workspace*. The Project Workspace window manages four different 'views' of your project. You switch between the views by pressing icons in the bottom left of the window.

The *ClassView* is a completely new view that lets you see the classes in your project. Figure 2 shows the ClassView display for a basic document/view based-application. ClassView parses its information at runtime so it is much easier to use than the browser, which relies on post-compiled information. A right mouse button menu lets you look up the definition, references, and other information about the class or class member.

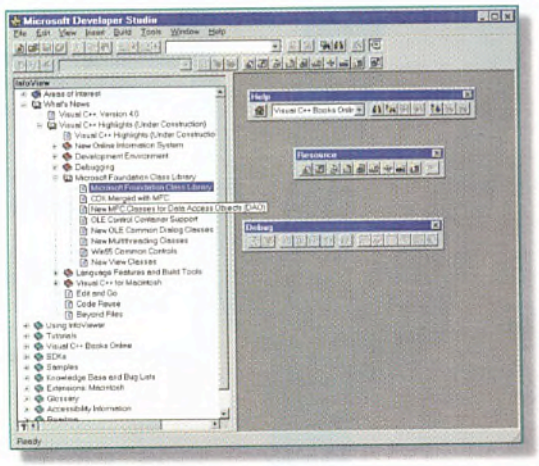


Figure 1 - VC++ 4.0 at startup

There are a variety of visual cues in the ClassView class tree that let you quickly see the attributes of a class member. For example, a private member has a little lock in its icon and a virtual member has a small key. Look closely at Figure 2 again and you will see the examples of the different icons.

The next view in the Project Workspace is the *ResourceView*. This is the window that you used to see when you double-clicked on a .RC file in the VC++ 2.x project window. One nice new feature is that the toolbar bitmap is now considered a different resource and has its own folder. This will help countless new Visual C++ users from wondering where that toolbar bitmap is located.

FileView is the old VC++ 2.x project window. Unfortunately, you can no longer group similar files together, a feature that I am really going to miss. It's not clear at time of writing why this is the case and if it will be a permanent non-feature.

InfoView, shown in Figure 1, automatically displays the index for any of the following MS products: Visual C++, Visual Basic, Microsoft Developer Network, Fortran Power Station and Microsoft Test. The InfoView window appears to be where the Microsoft Visual C++ team has spent a lion's share of its time, because it is packed with features.

There are two help toolbars that work with InfoView to let you look at help in almost limitless ways. You can define subsets, save searches, load multiple indexes, etc. I'm not sure how reassuring it is that the Microsoft boys have assumed that we need this much help, but they sure have gone out of their way to make it available and easy to use.

Class	Purpose
`CConnectionPoint`	Defines an interface used to communicate with other OLE objects.
`CFontHolder`	Encapsulates a Windows font object.
`COleControl`	Supports Windows window features and special OLE features such as event firing.
`COleControlModule`	Lets you initialise a control.
`COlePropertyPage`	Displays the properties of an OLE control in a tabbed dialog.
`CPictureHolder`	Encapsulates a Windows picture object.
`CPropExchange`	Provides the interface between a control and its properties.

Table 1 - The new OLE control classes

Class	Purpose
`CSyncObject`	Serves as a base class for the other synchronisation classes. Defines the default `Lock` and `Unlock` virtual functions which are overloaded by derivatives.
`CSemaphore`	A semaphore class that maintains a count of the number of threads currently accessing a resource, and lets you limit that number.
`CCriticalSection`	Allows only one thread at a time to access a specific resource.
`CMutex`	Allows only one thread mutually exclusive access to a resource.
`CEvent`	Provides a mechanism for one thread to notify another that an event has occurred.
`CSingleLock`	Helper class that works with one of `CSyncObject`'s derivatives to control access to one resource.
`CMultiLock`	Helper class that works with `CSyncObject` derivatives to provide access to multiple resources.

Table 2 - Synchronisation classes

Component Gallery

One of the most exciting additions to the Visual C++ IDE is the Component Gallery. This tabbed dialog stores canned components that you can quickly and easily load into your projects. The components can be just about anything: MFC extensions, OCXs, wizards, or just plain C++ classes. The Component Gallery will be especially valuable for VC++ workgroups because now there is a clear way to create and share components. Figure 3 shows the Component Gallery with the default entries.

Speaking of workgroups, the IDE now has an interface to source code control systems. Of course one of the first systems to work with the interface is Microsoft SourceSafe. You will be able to check in and out files and other source code control administration from within Visual C++.

The Debugger

And now the tour takes us to where, even though some won't admit it, most developers spend the majority of their time: the VC++ debugger.

One of the coolest features of all in 4.0 seems trivial at first, but once you've used it you cannot imagine how you lived without it. Basically, when you are debugging, instead of having to bring up the quickwatch dialog to see the value of something, you simply rest the pointer there for a second and *voila!* - the value pops up in a ToolTip-like window (hence the name *DataTips*). Figure 4 shows a DataTip being displayed. This feature is so nifty that it takes a couple of days to stop loosing your train of thought in the debugger. With DataTips, you tend to aimlessly float your mouse around looking at the value of variables you don't even really care about, just for the pleasure of it. Whoever thought of DataTips should *definitely* get a free dinner at Bill Gates' new house!

The way that variables are displayed by DataTips, and in general throughout the debugger, can be customised in 4.0. There's a file, AUTOEXP.DAT, that lets you specify how you would like different types displayed. For example, here's an entry for `CSize`:

```
CSize =x=<x> y=<y>
```

This will cause `CSize` to be displayed as `x=100 y=200` in all of the variable windows. Features like this, used wisely, really save

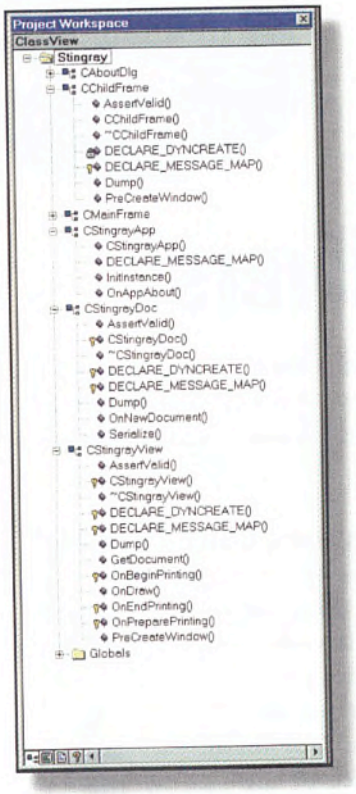


Figure 2 - ClassView display

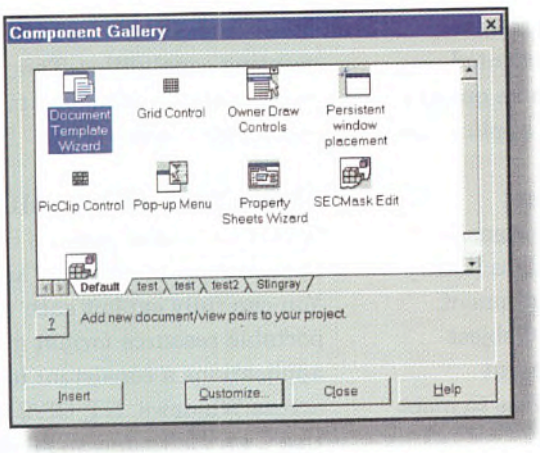
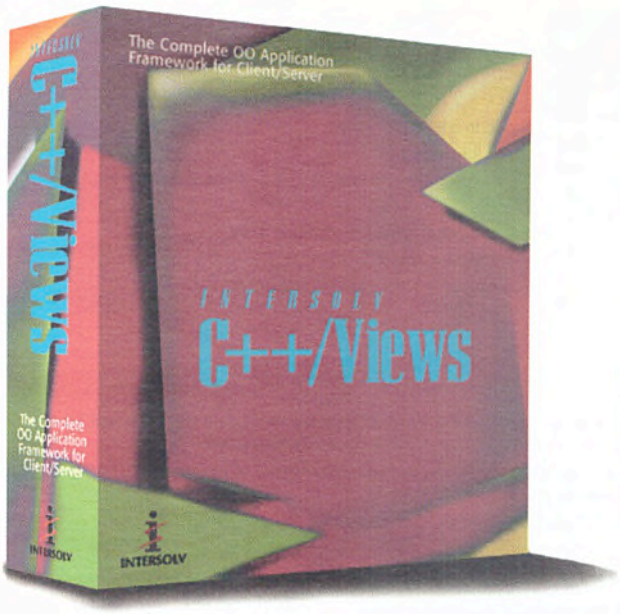
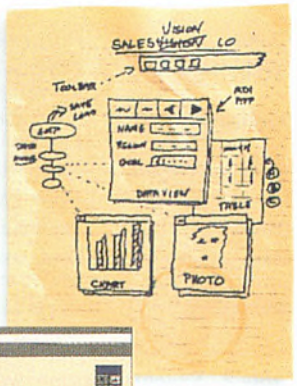


Figure 3 - The component gallery



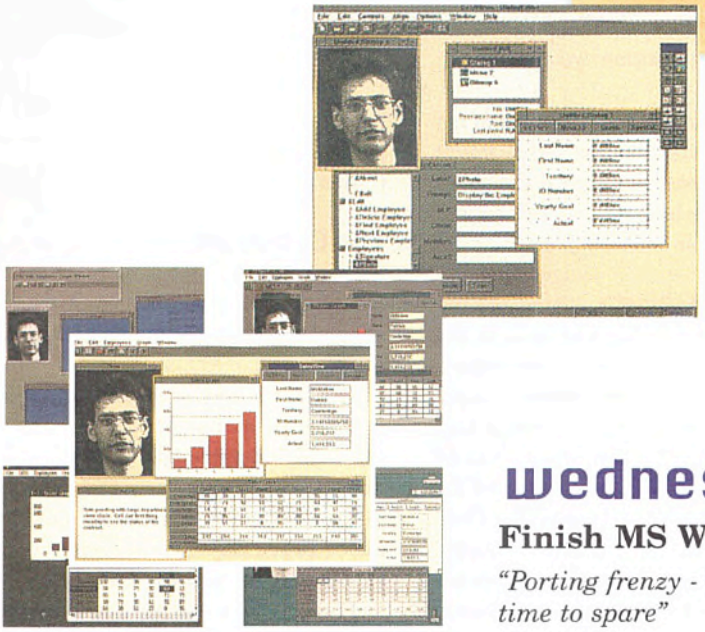
When the Deadline Demands Action...



monday....

The assignment

"OH NO! I agreed to get this application built by Wednesday... on Windows, Motif and OS/2."



tuesday....

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wednesday....

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```
BOOL CMDIFrameWnd::LoadFrame(UINT nIDResource, DWORD dwDefaultStyle,
    CWnd* pParentWnd, CCreateContext* pContext)
{
    if (!CFrameWnd::LoadFrame(nIDResource, dwDefaultStyle,
      pParentWnd, pContext))
    pParentWnd = 0x00000000 {CWnd hWnd=0x15d20000}   <-- DataTip

    // save menu to use when no active MDI child window is present
    ASSERT(m_hWnd != NULL);
    m_hMenuDefault = ::GetMenu(m_hWnd);
    if (m_hMenuDefault == NULL)
        TRACE0("Warning: CMDIFrameWnd without a default menu.\n");
    return TRUE;
}
```

Figure 4 - Debugging with DataTips

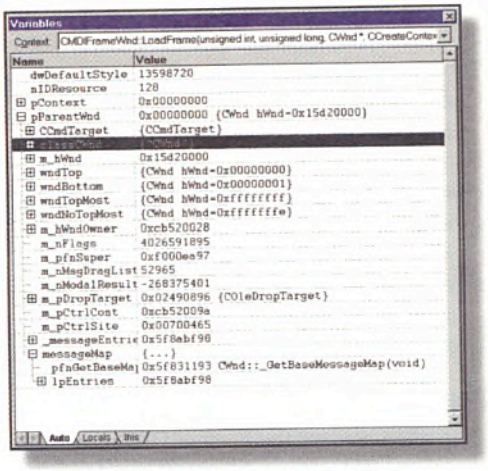

Figure 5 - The variable window

time and make the product much easier to handle. By the way, this feature is called *AutoExpand*.

Another new feature of the debugger is a new Variables window. Figure 5 illustrates the three tabs of this window: *auto, local,* and *this*. The 'auto' tab very handily guesses at what you will be interested in and automatically makes it available. The 'local' tab shows locals and the 'this' tab shows the C++ `this` pointer.

In addition to DataTips and the brand new Variables window, the quickwatch, breakpoint, and even the Watch window have been seriously modified and each have some new features. **Warning!** Beware that in 4.0, they have changed the breakpoint toolbar icon from a little hand to a circle. It took me hours to realise where the handy breakpoint toolbar item disappeared to. This smells suspiciously like change for its own sake.

The code editor

The next place you have probably spent a good portion of your Visual C++ life is the code editor. If you're a Brief or Epsilon (Emacs) user, you'll be glad to hear that with 4.0, the editor now has key mappings for those editors. (What? And just when you had sussed the standard Visual C++ editor keystrokes? Oh do stop whining!)

A very handy new feature in the editor is a .h button on the window title of a .cpp file. Pressing the .h button instantly opens the matching header file for that class. No more having to search around the project window or File Open dialog for your header files! Some of the most common ClassWizard functions are also available at the top of the edit window. You can add a function and also delete a function using the new tools in the edit window. Figure 6 shows all of the new code editor toolbar buttons.

Resource editors

These days, developers spend a lot of time building dialogs, drawing bitmaps and editing other resources. Microsoft has beefed up most of the editors in 4.0 and now creating resources is even easier.

In the old 2.x resource view, you could preview bitmaps and icons by bringing up the properties window. Now in 4.0, you can preview everything, including menus and dialogs! You no longer have to open every dialog to find the one you are looking for. Figure 7 shows a preview of a menu and a dialog.

While we are on the topic, the dialog editor now supports all of the Windows Common Controls as well as OLE Controls. (More on OLE Controls in the MFC tour.) The dialog editor has new guides and rulers that help with the precise layout of dialog elements. Figure 8 shows the new dialog editor features.

The menu editor has another nifty feature: a 'check mnemonic' option that automatically makes sure all of your menu items have mnemonics and that they do not collide.

VC++ 4.0 supports a new concept of resource templates. You can create a template resource, for example a dialog with certain OK / HELP / CANCEL button layouts, and then use the template as the starting point for other dialogs. This feature is nice for corporate environments where all applications need to follow consistent resource layouts.

This concludes our tour of the new integrated development environment features in 4.0. Next stop, the latest and greatest Microsoft Foundation Classes.

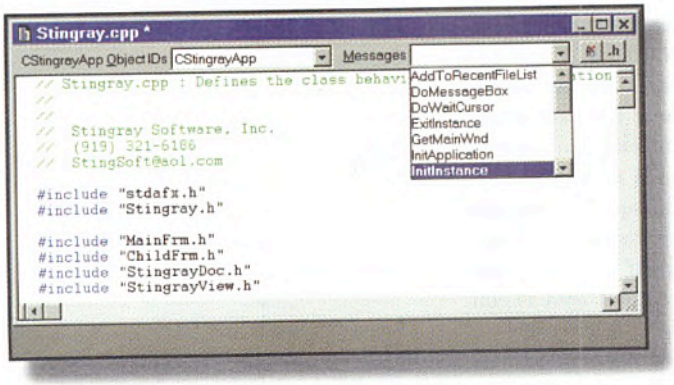

Figure 6 - The new code editor toolbar

MFC 4.0

MFC 4.0 features complete support for Windows 95. All of the control bars, tooltips and other MFC GUI classes now use the Windows Common Controls for drawing instead of drawing them inside MFC. The common dialog classes now use the Windows 95 like Explorer-common dialogs and there are new MFC classes that encapsulate the OLE common dialogs and the Page Setup common dialog.

MFC 4.0 even provides some new `CView` derivatives that let you use Windows common controls in a document/view application: `CRichEditView`, `CTreeView` and `CListView`. These views even support print preview and printing.

The biggest change in MFC, both internally and externally, is the ability to use OLE controls. In version 2.x you could create OLE controls, but you could not put them in MFC applications without a lot of custom OLE work, so they were for all practical purposes unusable.

MFC 4.0 fixes that by adding OLE containment support right into class `CWnd`. By placing OLE control support in `CWnd` you can create OLE controls anywhere instead of just dialogs. To create a control you use the new `CWnd::CreateControl()` function which is identical to `CWnd::Create()`, except you specify the OLE CLSID of the control.

The Control Developer Kit has been merged with MFC - they are no longer separate products. The ControlWizard is now considered just another Visual C++ Wizard.

There are several new MFC classes that help with the creation of OLE controls. Table 1 provides a quick overview of the new OLE control classes.

For you Win32 enthusiasts that are using multithreading, there are several new classes that help by encapsulating thread synchronisation mechanisms. Figure 9 shows the MFC hierarchy diagram of the new thread synchronisation classes in version 4.0, and Table 2 lists the classes and briefly explains their function.

Data Access Objects

Just when you got the hang of ODBC and the ODBC MFC classes, Microsoft has introduced another database access method and, of course, MFC classes to go along with it. As with ODBC database classes, *Data Access Objects* (DAO) let you open and manipulate databases and record sets, and display the data in a form view. DAO also allows you to set up and use workspaces, create and manipulate tables and queries, and use and create indexes for those tables through the use of the SQL Data Definition Language. The DAO classes encapsulate an OLE interface to the Jet database engine, so you don't have to write the SQL yourself unless you want to do so. You can also still access ODBC data sources using the DAO classes and the Jet engine.

There are so many new classes in MFC 4.0 that the latest hierarchy chart practically fills an entire wall of my work area! But that concludes our tour of the new features in MFC. Next stop is the compiler and build utilities.

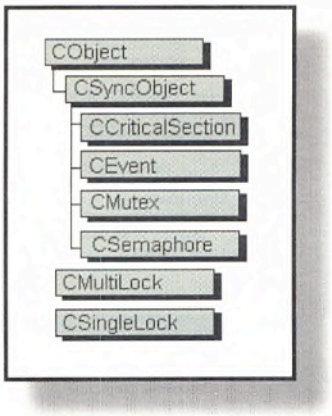

Figure 9 - Hierarchy of multithreading classes

Language features

The new C++ language features are *namespace support* and *Run-Time Type Information* (RTTI). MFC itself still uses the class `CRuntime` and the `DECLARE/IMPLEMENT` macros, instead of standard C++ RTTI. Maybe in a future release they will switch these macros over.

There's also some great news for generic programming enthusiasts. In VC++ 4.0 the template support has been dramatically improved and the compiler can now compile the *Standard Template Library* (STL). There are still some complications when using STL with MFC, but VC++ 4.0 contains a document on how to get around these problems using namespaces.

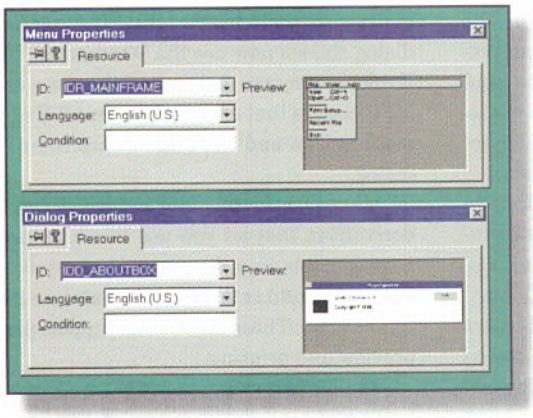

Figure 7 - Example preview of menu and dialog

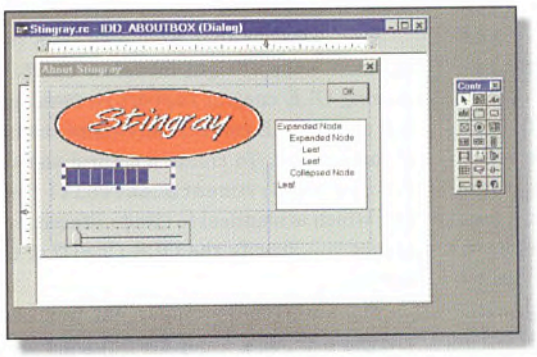

Figure 8 - Dialog editor with dialog elements

Build features

When Microsoft introduced the incremental linker in 2.x, there were mixed emotions because you could only change about five lines of code without having to go through another complete link. They seem to have drastically improved their incremental linking technology in 4.0 and you can now change much more code and still have the speed of incremental links.

Microsoft has introduced two new build features with 4.0:

Minimal rebuild - Visual C++ has an option that goes beyond simple header file time stamp checking. Instead, the compiler also checks if what you have changed will require a recompile on a module-by-module basis. For example, if you add a comment to a header that is contained in eight modules, none of them will be recompiled with this new technology. This is a project option.

Incremental compilation - In previous versions of Visual C++, if a source file was modified in any way, the entire file would be recompiled during the next build. Incremental compilation is a process in which only the changed functions (and functions affected by a change) are recompiled... within an individual source file. For example, if a source file contains 200 functions, and only one function is changed, then only that function is recompiled, provided that the change to the function does not have ramifications outside of the function's scope. This is also a project option and is set on by default.

The results from combining all three of these build features are quite impressive. Using the product on a day-to-day basis, you notice a major decrease in build time and a resulting increase in productivity. With every release, Visual C++ is getting closer to the Visual Basic 'edit and run' model without sacrificing the performance of a compiled language.

Thanks for coming

I hope you have enjoyed this quick tour of the major new functionality in Visual C++ 4.0. So much stuff has changed that in this article I have only been able to touch on the high points. There are still plenty of exciting sites to see, so go ahead and install 4.0 and do some exploring of your own.

Thank you for taking the Visual C++ 4.0 tour and remember to tip your tour guide on your way off the coach. ■

Scot Wingo is a co-founder of Stingray Software Inc., a company that produces MFC Extension class libraries. He is also co-authoring the book MFC Internals. *Scot can be contacted via email at: ScotWi@aol.com.*

Visual C++ 4.0 is available on subscription only and costs £395. the subscription entitles you to one major upgrade and two minor ones. Microsoft is on 0345 00200.

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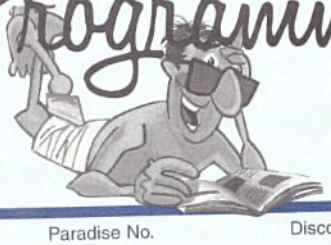

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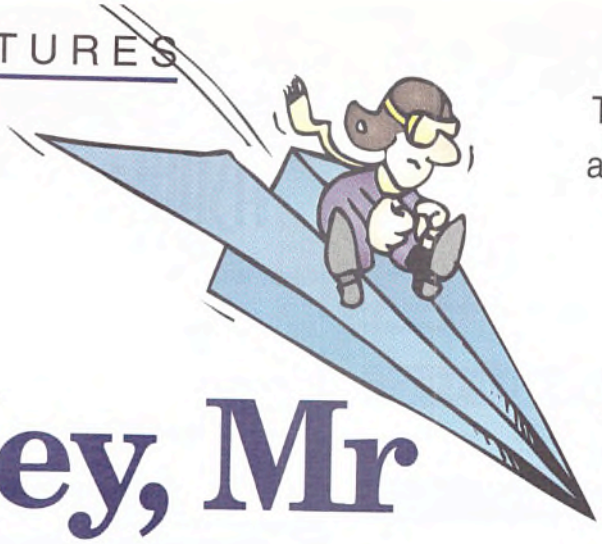

The UNIX Sendmail program is as ubiquitous as the Net itself. **Peter Collinson** spoke to its author Eric Allman about how it came to be written, the latest version, and that infamous DEBUG hole...

Hey, Mr Postman

I interviewed Eric Allman in early July. He was just finishing his second period of working for the Computer Science Division at the University of California, Berkeley. Eric is responsible for a number of components that run on nearly all UNIX networked systems. He conceived and wrote the program `syslogd` which collects error messages from the kernel and background daemons. It centralises fault reporting in one configurable system, rather than having ad hoc logging files. I chose to concentrate on his main contribution to the network: `Sendmail`.

You are currently working at the moment for Berkeley on the Mammoth project, is that right?

Actually, the Mammoth project is over. I am now on the Titan project. One might argue that this is the Mammoth project with a different name, although it's trying to do more than Mammoth did. Briefly, it's a project to provide infrastructure to support research. It means that we get to put in network gear, file servers and software and so forth. The idea is to improve the research environment in the Computer Science Division.

And you are shortly leaving...

Very shortly. I am going to work for Pangæa Reference Systems, a start-up in Silicon Valley doing information archiving and indexing. I can't say exactly what we are going to do as yet, obviously. Suffice it to say that we will try and index everything that we can get our hands on.

You are best known for `Sendmail`. I always think that `Sendmail` is often much maligned, but without Sendmail the Internet would be very different.

Well, mail was originally done as 'oh by the way, as long as we have this network here, maybe we can do electronic mail'. It was kind of a secondary thought initially, but I think it has become one of the most important things on the Internet. In part it's because, unlike other things, it works across the 'little-i' internet, what John Quarterman calls 'The Matrix'. It includes people who are connected by UUCP, Fidonet, DECnet and so forth.

What were you doing at Berkeley when you started to get involved with mail? You started with a program called `delivermail`, I think.

That was a long time ago. I was working in the INGRES project. We had a PDP-11/70 and we got an ARPAnet connection. This was long before the days of the Internet. The ARPAnet connection ran NCP, the Network Control Protocol, which pre-dated TCP/IP. We had what was called a VDH (Very Distant Host) interface that drove the line at 9600 bps using a dedicated modem. At the time, this was pretty fast. A 56 Kbps modem was a full six foot high rack of gear, whereas the VDH interface was only about a foot high.

There was a bunch of people in the faculty that wanted access to the ARPAnet because they wanted to use email to talk to people at other universities. The only way that we could do this was to give these people terminal line access to the PDP-11/70. We only had 16 ports and most of these were owned by people on the Ingres project. We ran two ports over to the patch panel that we used to connect people to machines. People would go and physically plug their line into our machine.

About that time, Eric Schmidt, who is now high up in Sun, had done something called 'Berknet': a UUCP-like network, only it ran over dedicated lines. It wasn't dial-up. We had connected maybe a dozen machines around the campus. It was a pure batch system using file copying; you could do remote execution where you said: 'Please run this job' and about an hour later you would get the output back.

We wanted to set things up so that the people who wanted access to the ARPAnet could do so from their own machine, a VAX 11/780. The ARPAnet didn't come into the VAX because at the time the machine could not drive the VDH interface, you needed UNIX Version 6 and we were running that on the PDP-11/70. We decided that we would write something so that people could type mail on their own system, and have it sent off to the ARPAnet. It was an innovative idea at the time.

It turned out to be a little harder than it might at first seem. UNIX mail and ARPAnet mail were completely separate. If you wanted to send mail to both a UNIX mailbox and an ARPAnet mailbox, you had to put the message in a file and send the file twice, once to UNIX and once to the ARPAnet.

We wanted to make the mail integrate more seamlessly than this. The possibility of having everyone convert to a new mailer was pretty daunting. Also we wanted to cope with both UUCP and Berknet connections. It was necessary for all these systems to work together.

I spent a lot of time thinking about the problem and could not find a way to make things work. Finally, one day, I felt that it was so critical that I sat down and started to write the code. As I wrote the code, it became clear what to do.

The program turned into `delivermail`. It was purely to solve our problems and was very specific to Berkeley. The configuration was compiled in: I wired knowledge about address types into the code — if there was a colon in the address then it was Berknet mail, if there was a exclamation mark it was UUCP mail, and if there was an at sign then it was ARPAnet mail. There was no run-time configuration at all.

The `delivermail` program went out in 4.0BSD. It was not that great, but it was better than anything else that was available. To get it going, there was a `conf.c` file that you could recompile and customise for your site. I think that delivermail was probably out for three months before I started to work on run-time configuration. It had become too much of a pain to recompile all the programs on all of the machines we ran when you wanted to change something in the routing.

This is where `Sendmail` came from. It started out as a very simple modification of

Allman

> "IBM has probably done more major hacks on Sendmail than anyone - it has hacked itself into a corner."

`delivermail`. In fact, if you look at the SCCS files for `Sendmail` and pull out revision 1.1, you will have `delivermail`.

I started throwing stuff into the configuration file. At the same time the TCP/IP standards were being worked on. Host names went from single words like 'MIT-XX' to the domain style '`xx.mit.edu`'.The configuration file grew...

...and this grew into the `sendmail.cf` configuration file?

You must realise that the first config file was about ten lines long and the syntax didn't seem to matter. At some point, I printed out the config file and said 'Oh my God, it's two pages'. However, by then I was dealing with 30 sites - 'far too many sites' to change the syntax. I was stuck with it.

The syntax became set during several transitions; from flat names to domain names; from RFC733 to RFC822, which changed the syntax of the mail headers; and there was a fundamental change in the ARPA mail protocol. Originally there was no separate mail protocol: it was part of FTP. The change from that to where we are today with SMTP was a very painful experience. If you look at the old RFCs you will find, I think, four RFCs defining various mail transfer protocols, of which RFC821 is merely the last. There were a couple of versions of MTP and a couple of versions of SMTP. `Sendmail` was tracking all of this.

I was putting all these changes into the config file. There are many things in the config file that are really fixed now, but they are still in there for purely historical reasons. In retrospect this was probably a mistake. At the time I didn't understand how the RFCs tended to evolve; I was afraid that they were going to flip back and forth.

I am really in favour of driving programs from data, that service programs should only be algorithms and constants should be imported somehow or other. I think that the `sendmail.cf` file provides you with a programming language to control what happens.

You have to get the balance right. There are places where `Sendmail` got the balance wrong, in both directions frankly. There are places where I have wanted to tweak something at runtime. In fact, you will see a bunch of things in the most recent `Sendmail` (Version 8) where stuff that was built into the code has moved into the `sendmail.cf` file. I have actually expanded the config file.

But it's good to think of the `sendmail.cf` file as a programming language rather than a simple setup file. If you take the attitude that the config file is a programming language then things become easier. Clearly you want some good wrappers around the file, because it is designed for computer parsing rather than human authoring.

I have always made wrappers using the m4 macro language. The `Sendmail` 8 macros are the third or fourth set that I have done. They seem to be right, or close to right. One of the things that I did was to allow the setup files to be extensible, so you can add local hacks into the macro setup file rather than editing the final `sendmail.cf` file. There are still some situations where you can't do that, but it's pretty rare.

When you were tracking all the early RFCs did you have any influence on what was happening?

Yes, but I didn't understand what influence I had. At the time, the government was funding MMDF. I was doing `Sendmail` at Berkeley. It was not the case that I was hiding it from people, but it never occurred to me to make a big deal about it. The MMDF folks, Dave Farber was the Principal Investigator and Dave Crocker was doing most of the implementation, heard about `Sendmail` at one of the Berkeley UNIX Steering Committee meetings. I think that they were quite shocked because it was their understanding that ARPA was funding them to do the Internet mailer.

The problem with MMDF was that it didn't attempt to fit with existing mailers. They adopted the old TENEX approach, saying 'you are going to fit with our mailer, your back-ends are going to speak our protocol'. `Sendmail` succeeded in part because instead of saying 'you have to change your view of the mail world', it fitted in with what existed already. You could use your old user agent and your own local mailers and `Sendmail` adapted to you.

When was `Sendmail` generally released?

I think that it was put out with BSD 4.1a, but it really hit the world with 4.2 BSD. About the same time as 4.2 BSD came out I left the University to work at Britton-Lee. I had graduated; I worked as staff on the INGRES project for a couple of years and then went off to Britton-Lee. I was going to make my fortune in industry. Sadly, this didn't work out all that well.

Britton-Lee was actually very generous and let me put a fair amount of time into stabilising `Sendmail`. But there was a point where I had to give that up and go on to do what I was being paid to do. I sort of abandoned `Sendmail` at that time.

And several companies picked it up - security problems and all...

You have to remember that the Net back then was a kinder, gentler place. People on the whole co-operated with each other: we were building bridges, not walls. Security was not so much of an issue.

For example, the DEBUG hole that Robert Morris exploited with the infamous Internet worm was the ability to turn on a debug flag and send mail to an arbitrary file or program. The old ARPAnet mailers that I had been using had that feature as standard - you didn't have to set a debug flag. You could send mail to anybody's program anywhere on the ARPAnet and it would just happily run.

I looked at this and thought 'this is a security hole, I am not sure that I want to allow anyone to run any arbitrary program on my system'. So I took it out. I was nervous about taking it out because the functionality had been there for a long time. I wondered if there was a good reason for it, perhaps some ARPAnet service required it. So I set it so you could set a debug flag. Of course, it turned out that no-one did need it.

Some time later, I was doing debugging and there was a system on campus with administrative things on it, and they would not let me have an account on the machine. They still insisted that they had to run Sendmail because they had to get out to the Net and they insisted that I support it. So I added the ability to debug things from the Net, com-

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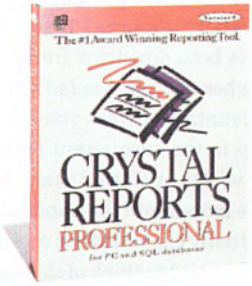

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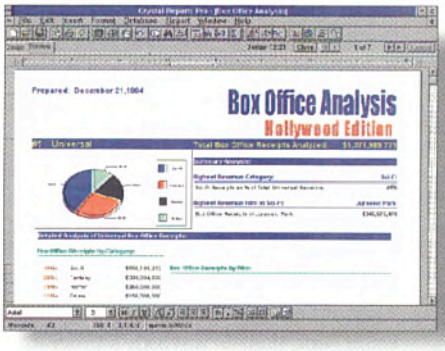

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CIRCLE NO. 341

pletely forgetting that I had put in the ability to run programs when the debug flag was set. I had created a hole that I had forgotten about. The important thing to remember was that originally I was simply cloning an existing feature.

Since then `Sendmail` has become a target, perhaps unjustifiably, for people complaining about security. One of the things that MMDF does is use much less superuser privilege, whereas `Sendmail` is a single large root owned process. Have you thought about splitting `Sendmail` into several smaller processes and only becoming root when you need to?

There is always a trade-off between security and functionality. There are several places in `Sendmail` that need to able to `setuid` to an arbitrary user. For example, your `.forward` file does not have to be world-readable. Your home directory doesn't have to be world searchable. `Sendmail` will forward mail, even over NFS mounted file systems where you don't get root privileges, by becoming 'you' before reading your `.forward` file. You have to be root to be able to become an arbitrary user in order to read their `.forward` file.

Think about having a small `setuid` deliver program. To support the current `.forward` functionality, `Sendmail` would want to call a program that accepted a user id and a program to be run by that user. If `Sendmail` can do that, anyone can. There are tricks to make this work, but they have their own problems.

There is another issue too. Many of the security problems have been network related: people using the Net to try to get into a machine that they are not supposed to have access to. You don't have to have root access, all you have to have is access. So the problem is not so much that `Sendmail` runs as root, the problem is that it listens to a port on the network and does something on the basis of what it is sent.

Well, that's the definition of SMTP, so what are you going to do to prevent access? You can start doing very exhaustive and restrictive validation of the addresses that are sent. In fact, `Sendmail` 8.6.10 and 8.7 started doing certain additional checks. For example, `Sendmail` 8.7 prohibits some special characters in addresses. The idea was to thwart some of these nasty attacks.

However, I have already got into trouble where I tightened up on special characters. It turned out that X.400 addresses used those characters. So if you had an X.400 address tunnelling through SMTP, `Sendmail` would reject it. The trouble is that the left hand side of the address is extremely flexible, legally flexible, so it's almost impossible to restrict access by checking it.

So, I can imagine that if I said that I won't do X.400 addresses, I won't do sending to programs, I won't do forwarding — the only thing that I can do is receive mail that is sent to another SMTP site or is delivered to a local mailbox — then things would be much more secure. However, people want these extras.

You said that when you went to Britton-Lee, you dropped `Sendmail`. Did the book start you up again?

There were two things, really. The `Sendmail` book by Bryan Costales was one of the issues. Also, I had come back to Berkeley by then. When I got back to Berkeley, about six years ago, the email address of a user was his workstation. You could not send to someone at `cs.berkeley.edu`. There were political reasons for this.

I love Berkeley dearly and enjoy my work there. The last six years or so have been wonderful, probably the best work experience of my life. But there is a tendency to organise groups as a series of fiefdoms. So instead of having people agreeing that there would be a CS division, there were 'projects'. Mail was addressed to projects and not to the CS division. For example, if you were on the Postgres project your mail address would be `user@postgres.berkeley.edu`; on the Sequoia project, your address would be `user@sequoia.berkeley.edu` and so on. This meant that there was no presence on the Net which was the Computer Science division.

Part of the aim of the Mammoth project was to encourage the Department to work more like one unit, and one way I wanted to do that as a psychological matter was to make everyone's email address appear to be from the same place.

I could have used the old `Sendmail` and re-written everyone's email address to appear to come from `cs.berkeley.edu`. But it was more complicated than that: I needed to be able to route inbound mail to a particular machine. I added a user database to do this. If the user was in the database, I changed their outgoing address to be from `cs.berkeley.edu`.

Machines at Berkeley are managed by many people and I needed to cope with the problem of some new user popping up on a machine and sending mail. Mail for these accounts was not rewritten so replies to them would work. All this required some code changes, so even before the book happened I had started to hack on `Sendmail` again.

When Bryan started writing the book, he came and said 'Do you mind if I write your book for you?' I said, 'Please, it's obvious that I am never going to get it done.' He asked me to review drafts and of course I did.

Out there, there are several versions of `Sendmail`: there's the IDA one and Paul Vixie's 'King James' `Sendmail`. What relation do these have to the new `Sendmail`?

There are about three versions of IDA `Sendmail`. IDA `Sendmail` started as a set of configuration files. In the process of doing the configuration, they decided that they wanted to make 'minimal code changes', just to put in things that they absolutely had to.

IDA put in a bunch of things, some of which I have put in `Sendmail` 8 and some of which I have left out, because I didn't feel that they were done in the best way. They tended to do a shortest path, solving their immediate problems with no real long term view.

Let's be fair too. I have had the benefit of looking at their code and deciding what to use.

Paul Vixie was responsible for the King James `Sendmail`. He had the idea that the King James version was going to become the ultimate version of `Sendmail`. It was going to be the unification of everything. This version goes out with Ultrix and OSF/1.

Who is picking up `Sendmail` 8?

Sun is going to take `Sendmail` 8, SGI already has, HP will be picking it up shortly, Convex has, Sequent has. I am not sure about IBM or DEC. Frankly, IBM has probably done more major hacks on `Sendmail` than any other vendor. I think that it has hacked itself into a corner. In general, it is making sense for vendors to go for `Sendmail` 8, because that's the version that the security folks are tracking. ■

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Further reading

The definitive book on `Sendmail` is *sendmail*, by Bryan Costales with Eric Allman & Neil Rickert. It's published by O'Reilly & Associates Inc, ISBN 1-56592-056-2.

You can get the latest version of `Sendmail` by anonymous FTP from `ftp.cs.berkeley.edu`, look in `/ucb/src/sendmail`.

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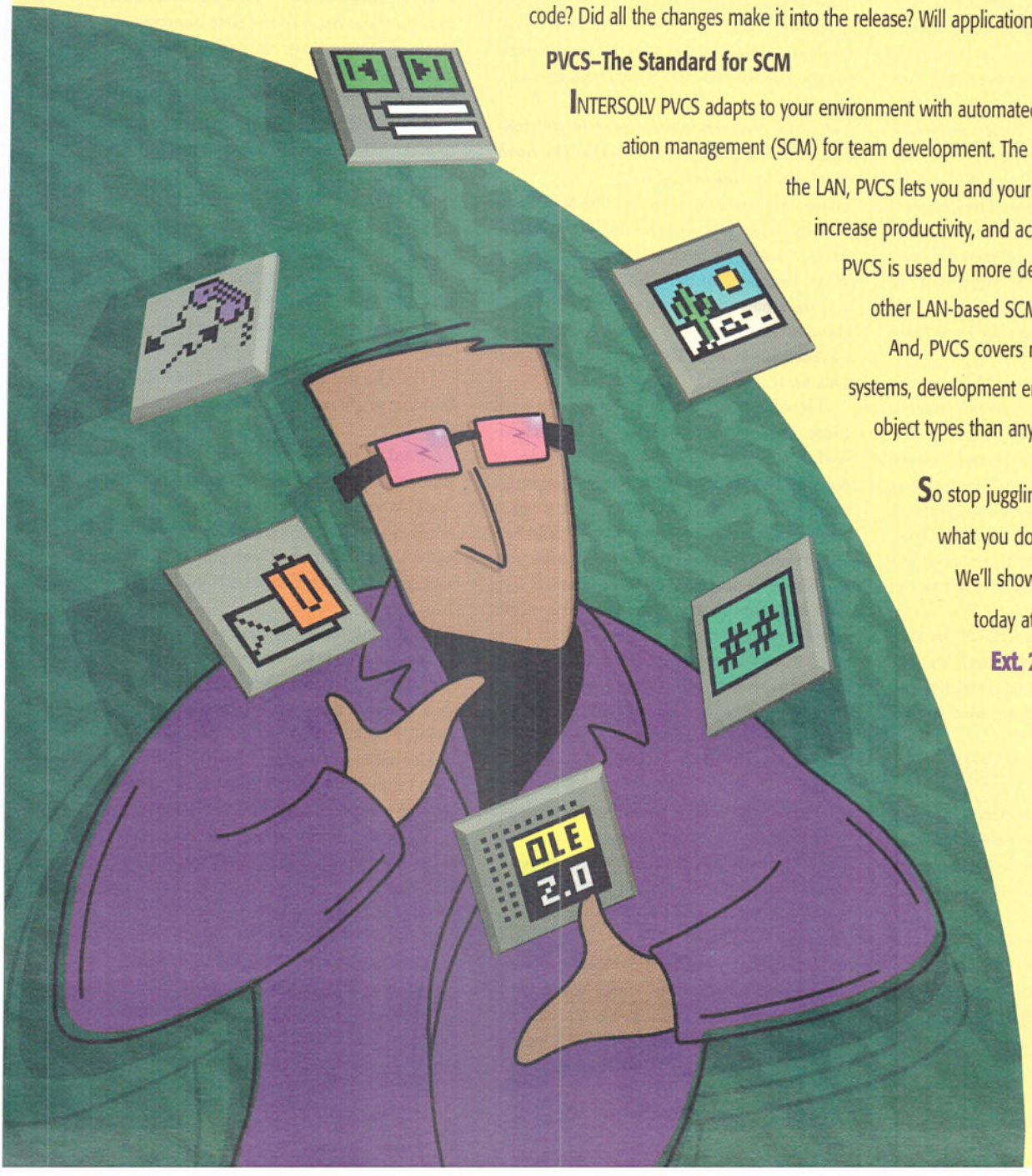

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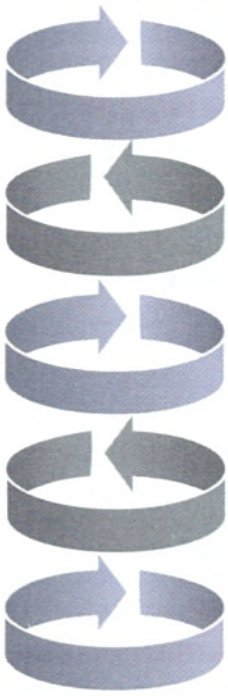
5 Reuse Cultures

Software reuse is an oft-named goal of software methodologies much less often obtained. **Mary Hope** argues that the failures and successes of reuse are dictated by the culture of the organisation.



Reuse promises so much and sounds so easy. The benefits have been well documented and, so it is claimed, will enable software development to move from the hand-crafted era to the factory production line. Cheap, standardised and pre-tested components will be bolted together to produce speedily the desired application. Metaphors for reuse abound, from electronic components to Lego, from car building to fitted kitchens. Putting components together to produce a customised product is not a conceptual challenge. We have become so comfortable with the concept of software development through the reuse of components that we are in danger of forgetting that it is a means not an end. The end we wish to achieve is the cheaper and faster production of reliable software that meets the needs of the user. Reuse is one of the means of achieving this, but if reuse adds time and cost then it does not achieve its objective. There is no intrinsic virtue in reusing components. If it does not bring us the benefits we require then forget it (at least in its present incarnation).

Another unstated but often implied part of the reuse myth is that you 'get it with object technology'. You do not get it with object technology, nor with any language, case tool or repository. In the words of Christopher Stone from the OMG, 'Code reuse is a discipline, not a language feature; it is a by-product of disciplined design and development methodologies.' It is primarily a *people* thing not a *technology* thing. The technology enables; it helps but it does not guarantee reuse. What is needed to ensure successful reuse is an organisational culture that harnesses the potential of the technology. What are the characteristics of such a culture? Or is it cultures in the plural? At the moment there seem to be five prevailing organisational cultures of reuse: *Scavenging*, *Anorak*, *Grey Suit*, *Organisational* and *Corporate*. The vast majority of organisations are at the scavenging or anorak level. The aim is to move to a corporate culture of reuse.

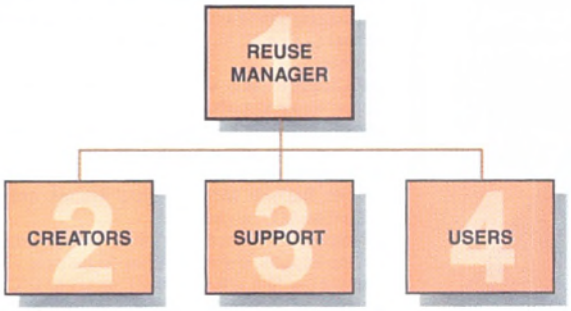


Figure 1 - Griss' four-team reuse organisation

The Scavenging culture

The Scavenging level of reuse is primitive, anarchic and predates object technology. It is almost always done at the code level. It requires no organisational support or classification system. It relies on the programmer remembering that something similar was used in another application. Scavenging is done in small, intimate groups. The quality of the code is evaluated through one's knowledge of the originator. It is personal, cheap and, in its limited way, it works.

One of the difficulties faced by universities teaching software development is that we have not worked out how to teach students to scavenge effectively. Scavenging is different from copying. It is a selective process that should improve the product but minimise the work. Currently we cannot differentiate between the two and frown on both. Scavenging therefore has to be learnt in the real world. The limitations of scavenging are that the unit of reuse tends to be small (a function or a class) and what is reused is limited by human memory and access. Once you try to widen the scavenging circle you have to introduce a classification system and more formal quality control. One step up the evolutionary scale are organisations that support an Anorak culture of reuse.

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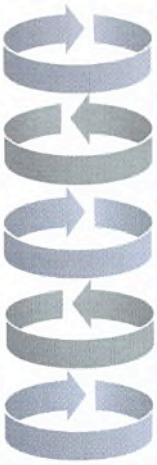
The Anorak culture



The Anorak culture supports the reuse of technical objects. It has a long history going back to Fortran programmers using libraries of mathematical functions. In today's terms it means the reuse of VBXs and classes/objects. There is an irony in the close association of reuse with object orientation and the reality of the extensive reuse of VBXs which make little attempt to pose as objects. In object-oriented programming the most widely reused classes are GUI ones, mainly in the form of the Microsoft Foundation Classes (MFC) and Borland's Object Windows Library (OWL). While these classes are generally free with the compiler, another source of technical classes is third-party providers such as Rogue Wave, which produces Tools.h++. This library offers classes to handle strings and dates, and a variety of container classes. Another source of reusable software is internal collections (I hesitate to call them libraries) of software units.

As in the scavenging culture the unit of reuse is small and the community involved consists mainly of programmers. However, organisations with an Anorak reuse culture are more organised. There is an acceptance that reuse is good but this is not backed up by a more formal endorsement. The implicit assumption is that reuse is primarily a technical issue.

There may be concern about what the unit of reuse should be. For instance at a recent *EXE* Software Developers' Show one vendor suggested that the unit for reuse should be OLE components. Whereas the general view has been that OLE technology allows the user to combine components from different sources it can also be a source of reusable software. OLE-compliant objects can be produced using whatever development tool and language the software developer wishes, but once they are in a binary form the means of production is irrelevant and they can be combined regardless of their source. OLE was advocated because it is here and usable. In the longer term, consideration has to be given to alternatives such as OpenDoc. The arguments are interesting and convincing.

It should not be assumed that an Anorak reuse culture is unphilosphical. This culture can encompass debates about Meyer's (Reference 1) demand that a good modular structure, which is a prerequisite for reusable components, should conform to the open-closed principle. That is, a module (class, component) should be open enough to be extended, for instance by adding new subclasses or functions. And yet it should be closed to modification so that changes to its implementation don't have repercussions for its clients. If it is a design component it should be approved and available in a repository. If it is a programming component it should be compiled and in a library.

The reuse debate revolves around programming issues and is carried on in terms understandable only by the technically literate. If an organisational strategy for reuse is dependant on debates such as COM/OLE versus CORBA/OpenDoc, then participation must be limited. If there is a strategy, it will be formed by those on the technical side of the organisation. The rest can only stand on the sidelines and watch.

The Grey Suit culture

In this culture there is wider participation in the development of a reuse strategy and there is a different focus on the unit of reuse. Reuse moves out of the domain of the technically literate to include middle management. The unit of reuse is now a *business object*. It is important to note that this may or may not be a class. It may be the end result of a developmental program and be an executable.

A business object is self-contained, has intelligence and is part of the business process. It may be a tangible component such as a customer, product, order form or account, or intangible and hold information about the business processes. Examples of intangible business objects might be closing a fiscal year, initiating an ATM transaction or preparing an insurance quote. The unifying factor is that they are all important to the business and each business object encapsulates rules and relationships. Because they are central to the mission of the company they are ideal candidates for reuse. An application should just *glue* together the business objects with minimal new code.

More detailed ways of describing business objects are still emerging. One proposal by Stewart McKie (Reference 2) is to describe them with the four characteristics of granularity, context, life cycle and utilisation.

- The *granularity* of a business object is one of component, container or composite. As the term suggests, a *component* business object is one that is used within another business object, such as a line discount calculation or an order credit control procedure. Generally speaking, it processes a piece of data. The logic must be that if this particular calculation happens in several places make it a component business object. A *container* object contains other objects. McKie gives Microsoft's OLE and IBM/Apple's OpenDoc as instances of container object architectures. But these are not true business objects because they do not themselves contain the intelligence necessary to behave appropriately. It is up to the user to ensure that they are used properly. *Composite* business objects are true business objects because they include intelligence. Like container objects, they are an amalgam of other objects, but they do not have to rely on the user to use them appropriately: they carry their own intelligence. For instance, a purchase order can contain intelligence about what is bought, who can buy it, at what price, from whom, on what terms etc.
- The *context* of a business object is, as you would expect, its role within the business process. This involves knowledge of other business objects with which it must interact.
- The *lifecycle* of an object is essentially a state transition model, ie the object's states and the events which trigger changes of state.
- The final part of the picture is the *utilisation* of the business object. Will it be reused as it is, or will it act as a template from which more specialised objects can be derived? Will it be reused or is it a one-off?

From Anorak to Grey Suit

An organisation that has absorbed business objects into its thinking has a Grey Suit reuse culture. It will probably also make use of technical classes, but the fundamental difference is that reuse has moved from the technical to the business arena. What are the ways of moving from an Anorak culture to a Grey Suit one? The lead can come from the technical staff, the middle managers or some fundamental business process re-engineering. It is probably too simplistic to say that the technical staff understands the possibilities but is not motivated and the middle managers are motivated but unclear about the arguments. It requires a merging of business and technical skills. The ease of this will vary from organisation to organisation. What will remain constant is the lack of shrink-wrapped business objects. An organisation going down this route will find articles on the subject and a few tools supporting their development but not much more.

One of the high-profile vendors in this area is Integrated Objects (Reference 3),

who developed NEWI (New World Infrastructure). It takes the view that co-operating business objects are what you build ,instead of applications. The user then interacts with the business objects to achieve a business aim. For instance, to get an insurance quotation for a customer, you pick up a customer icon (linked to a business object) and *drop it* on a quotation icon (another business object). The two have the intelligence to know what to do next! The product is aimed at 'the developer whose skill is in business solutions, rather than software engineering, to deliver business functions...' If this catches on there is a danger that we techies will be ousted from the software development process!

References

(1) Bertrand Meyer, *Object Oriented Software Construction*, Prentice Hall International 1988.

(2) Stewart McKie, Understanding Business Objects: using basic building blocks to build better applications, *DBMS* Feb 1995 Vol 8 No 2

(3) NEWI from Integrated Objects, Albion House, Oxford St., Newbury, Berkshire RG13 1GE. 01635 522600

(4) Martin Griss, Software Reuse: A process of getting organised, *Object Magazine*, 5(2), May 1995.

(5) Hitachi ObjectReuser, Hitachi, Advanced Software Centre, Whitebrook Park, Lower Cookham Road, Maidenhead SL6 8YA. 01628 585335.

(6) W. Tracz, International Conference on Software Reuse. *Software Engineering Notes 20* (2) 1995.

The Organisational culture

This is a further evolutionary step. Usually it will be preceded by a Grey Suit organisational culture, but it is possible for this to evolve directly from an Anorak culture. The key feature of an Organisational culture of reuse is the presence of a structure to support the reuse of components. There may also be organisational tools to help manage the reuse process.

Scavenging, Anorak and Grey Suit reuse cultures can be inspired and lead by individuals and do not necessarily involve changes to the organisation. However, if reuse is to be an integral function of the software development process there are organisational implications. If it is a discipline affected more by people than technology then ultimately decisions have to be made at board level about how the organisational structure can support reuse. Experience in this field is limited and there are, at the moment, no clear guidelines about the ideal structure. Martin Griss (Reference 4), one of the reuse gurus, suggests that the lifecycle for the process of creating reusable objects is sufficiently different from the lifecycle of using them that the two should be done separately. Asset creation should be done by one team and asset utilisation by another. He argues that there are four distinct processes and that these should be reflected in organisational structure. The four processes are creation, utilisation, support and management. Griss proposes a four-team reuse organisation as shown in Figure 1.

- The *creation* process provides reusable assets in a variety of ways. They may be new, re-engineered or bought in. This part of the process will be aware of the reuse possibilities within the organisation, through an analysis of needs and existing applications, and will be sensitive to market and technology trends.
- The *utilisation* part of the process produces a product from the reusable components. It also specifies new components, ie business objects required by the organisation.
- The *support* process manages and maintains the reusable objects. It is a library-like mechanism involving classification, storage and user support. One of the indications that this is the way forward is that tools to support this function are now starting to appear. More on this in a moment.
- *Management* is an overarching process that sets the priorities and controls the other processes. It assumes that there are some metrics for software reuse (are there?) and that decisions can be made on a rational basis.

Reuse tools

Tool support for reuse has mainly been in the form of browsers which enable a prospective user of an object to learn more about it. A different slant on how to support reuse is Hitachi's ObjectReuser (Reference 5). This is a new product that pulls in the crowds at product demonstrations but has not yet been absorbed into the software development process. It reflects and supports the mood of the moment and could have a good future. Essentially ObjectReuser provides an infrastructure for organising reusable components. It is totally flexible about what is considered to be a reusable component and imposes no particular classification system. It provides support for the user, the developer and the librarian.

A user can find the components in various ways. She can navigate through a classification hierarchy, perform keyword searches or look at datasheets that describe the components in terms of keywords, interface definitions and dependencies. The developer is guided to provide descriptions and hypertext/OLE2 links between components, and has access to version control facilities. The librarian has a set of tools to define access and quality control.

ObjectReuser is a tool for organisations that are serious about reuse! Because of its flexibility, organisations adopting it will have to define procedures and classification systems. It is not an off the shelf instant panacea. If an organisation has restructured to support reuse and has some tools for the storage and retrieval of objects then it can truly be described as having an Organisational reuse culture.

The Corporate culture

This is the icing on the cake. A Corporate reuse culture has all the characteristics of the Organisational culture, plus a company policy on motivating developers to produce and reuse components. It also has a meta-level process to reflect on, and continue the development of, the process. I have no experience of companies with a corporate reuse culture, but am sure that this is ignorance rather that a reflection of reality. Some must exist and much would be gained by hearing their story. Watch this space!

And finally...

If you feel despairing because your organisation is still in the early stages of developing a reuse strategy, take heart from one of the closing speakers at the 3rd International Conference on Reuse last November. Ruben Prieto-Diaz (Reference 6) made a number of predictions about what would happen before the year 2000. Note the future tense in this one: 'Many organisations will establish their corporate reuse programs.' This will be an area with interesting developments in the next few years. ■

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32-BIT NEWS!

OCX Versions. You're may be familiar with your new 32 bit Microsoft languages by now and wondering about availability of your favourite add ons. The following are available for both 16 and 32 bit development (ie inclusive in one package): GraphicServer; First Impression, Formula One, Calendar Widgets, Designer Widgets, LeadTools 5, VSFlex, VSVBX, VSView. More 32 bit OCXs are coming on stream every week; phone us for the latest or check out the OCX grid on our bulletin board.

Visual Basic 4 has arrived! We managed to get our hands on 50 Pro copies at the Microsoft launch party - did they disappear fast! We hope to have plenty of Pros and Enterprises in stock as you read this. Do note that the Pro version upgrade now costs £115 and includes paper docs. We also expect the Enterprise upgrade to include paper docs. There should be a Microsoft Computer-Based Training (CBT) on CD for VB4 coming out. It will cost £79.00.

Visual Foxpro upgrades have been selling steadily. Upgrade prices are for both version and competitive upgrades! We are waiting for the 'Mastering Visual Foxpro' CBT CD. It also will sell for £79.00

Upgrades. Check out the price lists for V (version upgrade) and C (competitive upgrade).

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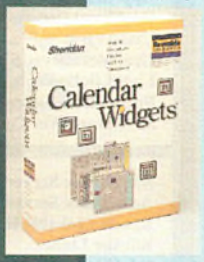

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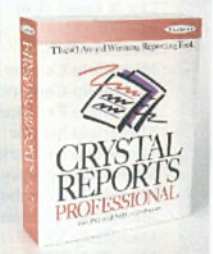

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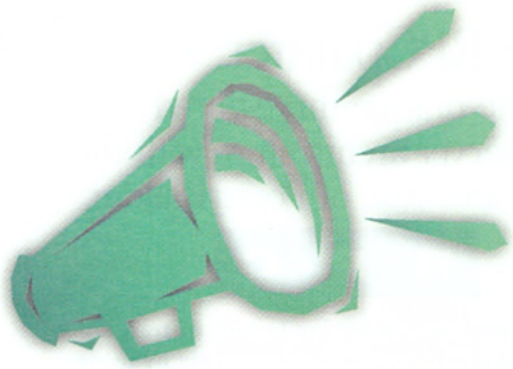

DELPHI component writing Part 3

In the concluding part of his guide to Delphi Component writing, **Dave Jewell** completes the development of his better-than-Windows-95 trackbar control.

In last month's instalment, I developed an enhanced trackbar control which provided quite a lot of flexibility in terms of its visual appearance. The emphasis last month was on the drawing code - as I left it, it looked very pretty but couldn't respond to user activity. This month, I'll complete the picture by turning the control into something that you can actually interact with using the mouse.

Getting the focus

As things stand, if you add several of our custom trackbar controls to a form, run the program and then use the TAB key to switch between the controls, you won't see much happening. Currently, the trackbar doesn't know how to alter its appearance when it gets the input focus. This is the first thing to put right.

There are various ways in which you can get a Delphi control to respond to changes in the input focus. From the perspective of the component *user*, he will normally get in on the act (as far as focus changes are concerned) by using the `OnEnter` and `OnExit` events. Although we could use these events inside the code of the trackbar component, we'd need to take care that the event was still available to the users of our component. It's quite possible to do this by overriding a protected implementation method, but (in this case) there's an approach that's simpler and more familiar to seasoned Windows developers.

By using the `message` keyword (something that we haven't previously looked at) we can achieve the same result as if we'd subclassed our control window in the normal way using `GetWindowLong`, `SetWindowLong` and so forth. Here's how it works. First, add the following declarations to the `private` part of the component's class declaration. The `FHasFocus` field is a simple boolean variable which tells us whether or not we've got the focus. `WMSetFocus` and `WMKillFocus` are special methods which are called whenever our control receives a Windows `WM_SETFOCUS` or `WM_KILLFOCUS` message respectively. We don't have to worry about how these methods get hooked into the control's window procedure - it all happens behind the scenes. By convention, such message-handling methods are always named after the Windows message that they process.

```
FHasFocus: Boolean;
procedure WMSetFocus(
  var Message:   TWMSetFocus);
    message WM_SETFOCUS;
procedure WMKillFocus(
  var Message: TWMKillFocus);
    message WM_KILLFOCUS;
```

Now add these two new methods to the implementation part of the unit. As you can see, when the focus is received, the `FHasFocus` variable is set to `True` and the `Paint` procedure called. Any existing `WMSetFocus` handler in an ancestor class is called before

```
function TCCTrackBar.CalcThumbRect (pos: Integer): TRect;
var
    r: TRect;
    X: Integer;
begin
    r := CalcTrackBarChannel;
    { Make the thumb twice the channel height }
    InflateRect (r, 0, r.bottom - r.top);
    Inc (r.left, ThumbWidth div 2);
    Dec (r.right, ThumbWidth div 2);

    X := MulDiv (r.right - r.left - 1, FPosition, FMax -
              FMin) + 4 + FBorderWidth + (ThumbWidth div 2);
    r.left := X - (ThumbWidth div 2);
    r.right := r.left + ThumbWidth;
    CalcThumbRect := r;
end;

procedure TCCTrackBar.DrawTrackBarThumb;
var
    r: TRect;
begin
    r := CalcThumbRect (FPosition);
    Frame3D (Canvas, r, clBtnHighlight, clBtnShadow, 1);
    Canvas.Brush.Color := FThumbColor;
    Canvas.FillRect (r);
end;
```

Listing 1 - Drawing the thumb

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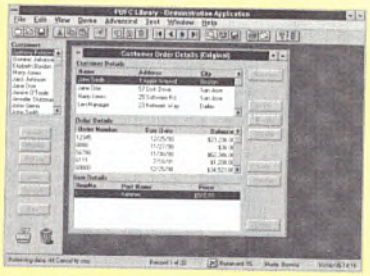

Only eight lines of code were required to build this customer order screen. A selection of some of the key functions now available to the user include the ability to:

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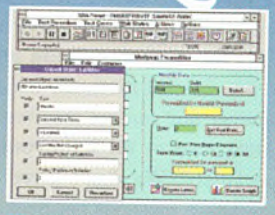

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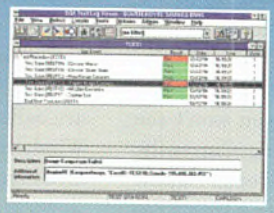

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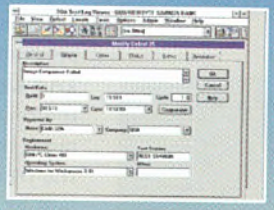

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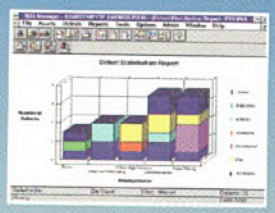

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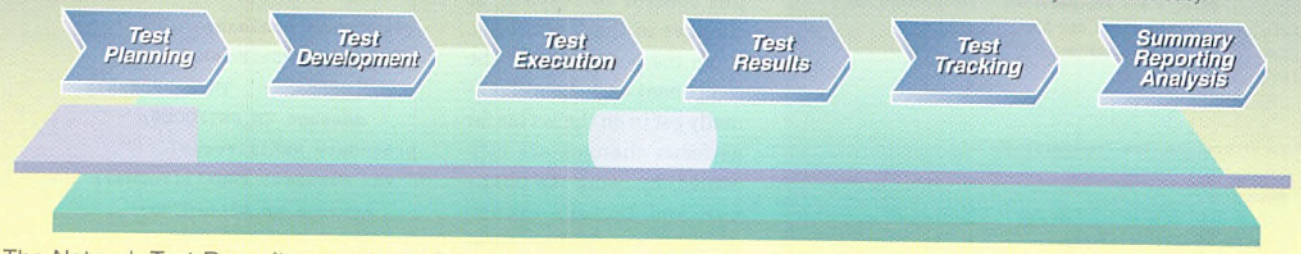

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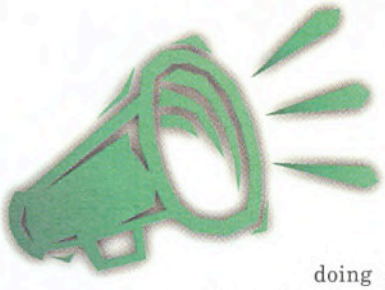


doing anything else. Similarly, the `WMKillFocus` method calls the `Paint` routine (covered last month) before clearing the `FHasFocus` flag.

```
procedure TCCTrackBar.WMSetFocus(
  var Message: TWMSetFocus);
begin
  inherited;
  FHasFocus := True;
  Paint;
end;
procedure TCCTrackBar.WMKillFocus(
  var Message: TWMKillFocus);
begin
  inherited;
  Paint;
  FHasFocus := False;
end;
```

In order to make this work, two small changes are needed to the `TCCTrackBar.DrawTrackBarFrame` routine. First, add the following code to the end of the routine:

```
if FHasFocus then
begin
   Rect := GetClientRect;
   DrawFocusRect(Canvas.Handle, Rect);
end;
```

And now add this statement immediately before the initial assignment to the `Rect` variable:

```
InflateRect (Rect, -1, -1);
```

Can you see what's happening here? In effect, we've reduced the size of our trackbar by one pixel along each edge, reserving the outer bounding box of the control for use by the focus rectangle.

There's a subtlety here: the `DrawFocusRect` routine works by exclusive-ORing itself onto the drawing surface. This means that if it gets called twice in a row, then the drawing surface is returned to its original state. This is why its crucial to set the `FHasFocus` field to `False` *after* calling the `Paint` method inside the `TCCTrackBar.WMKillFocus` routine. At the time `Paint` is called, it's important that `FHasFocus` is still `True`. This will call `DrawFocusRect` for the second time, causing the focus rectangle to disappear - which, of course, is exactly what we want to happen when the control loses the focus.

Hit Testing for Beginners

Okay - so much for responding to the input focus. Now let's get down to brass tacks and look at how the trackbar should respond to mouse activity. If you execute the code as it currently stands, you'll find that clicking on a particular trackbar won't automatically give the input focus to that control. First add a `MouseDown` handler which - among other things - gives the focus to the clicked control. Put the following declaration to the `protected` part of the class definition.

```
procedure MouseDown (
  Button: TMouseButton;
  Shift: TShiftState; X,Y: Integer);
     override;
```

This specifies a new `OnMouseDown` handler which takes care of mouse-down events for the component. (We're not publishing an `OnMouseDown` property for this control, since we don't anticipate that the user will care when the mouse is clicked on a trackbar. However, the user may well wish to do something special when the focus switches from one trackbar to another. We've already published the `OnEnter` and `OnExit` properties which cater for such situations.)

Now add the corresponding procedure body to the implementation part of the unit. After calling the inherited `MouseDown` method, this routine's first job is to call the `SetFocus` method. This eventually wends its way down to a Windows API `SetFocus` call which has the effect of sending `#WM_SETFOCUS` to the newly focused window, and `WM_KILLFOCUS` to the previously focused window. Because of the way we've set up handlers for these events, this will automatically cause the right thing to happen with the focus rectangle drawing.

```
procedure TCCTrackBar.MouseDown (
  Button: TMouseButton;
  Shift: TShiftState; X,Y: Integer);
begin
  inherited MouseDown (Button,
                       Shift, X, Y);
  SetFocus;
  if (Button = mbLeft) and
    PtInRect(CalcThumbRect(FPosition),
             Point (X, Y)) then
       fTracking := True;
end;
```

You can see that `SetFocus` is always called. However, we only set the `fTracking` variable if we've got a hit on the actual thumb rectangle in our trackbar. This means that you can only start dragging the thumb around if you first click on the thumb. Of course, you could easily change this interface if you wanted to. For example, you might want the trackbar to behave more like a scrollbar, where clicking on the channel area (not the thumb itself) causes the thumb to 'jump' towards the clicked position. This would be very easy to do, but I haven't bothered here. The declaration for `fTracking`, by the way, goes into the `private` part of the class definition. The value of `fTracking` simply indicates that we're currently tracking the thumb.

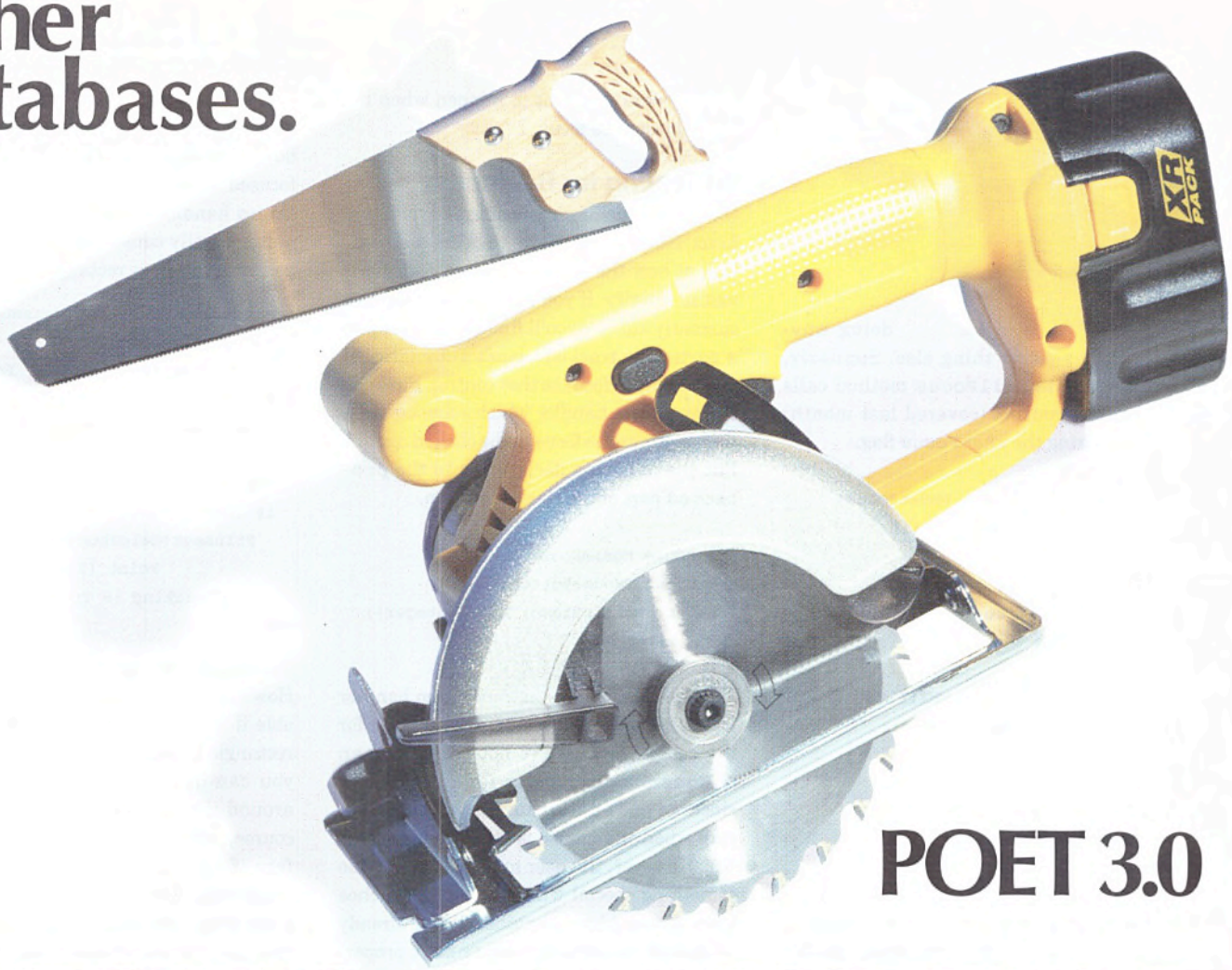
```
procedure TCCTrackBar.MouseMove (Shift: TShiftState; X, Y: Integer);
var
    r: TRect;
    pos: Integer;
begin
    inherited MouseMove (shift, X, Y);
    if fTracking and PtInRect (GetClientRect, Point (X,Y)) then
    begin
        r := CalcTrackBarChannel;
        Inc (r.left, ThumbWidth div 2);
        Dec (r.right, ThumbWidth div 2);
        pos := ((X - 4 - FBorderWidth - (ThumbWidth div 2))
                    * LongInt(FMax - FMin)) div (r.right - r.left - 1);

        { From here on, we could just assign to 'Position'. However, this
          would cause the whole control to be repeatedly redrawn as we
          drag the thumb around. A better approach is to just redraw
          the bits that need redrawing. }

        if pos < FMin then pos := FMin;
        if pos > FMax then pos := FMax;
        if pos <> FPosition then
        begin
            r := CalcThumbRect (FPosition);
            InvalidateRect (Handle, @r, False);
            FPosition := pos;
            r := CalcThumbRect (FPosition);
            InvalidateRect (Handle, @r, False);
        end;
    end;
end;
```

Listing 2 - When moving the mouse

Other Databases.



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You'll also see that because the thumb rectangle location is needed by both the hit testing code and by the thumb drawing code, I've added a new method, `CalcThumbRect` which returns the position of the thumb corresponding to the supplied position parameter. The new `CalcThumbRect` method and the revised `DrawTrackBarThumb` code are shown together in Listing 1.

In the same way, add the following method declaration to the class definition and the corresponding routine to your unit.

```
procedure MouseUp(
  Button: TMouseButton;
  Shift: TShiftState; X,Y: Integer);
     override;
procedure TCCTrackBar.MouseUp (
  Button: TMouseButton;
  Shift: TShiftState; X,Y: Integer);
begin
  inherited MouseUp (Button, Shift,
                     X, Y);
  fTracking := False;
end;
```

As you'd expect, this just clears the `fTracking` variable as soon as the mouse button is released. The real meat of the routine is in the `MouseMove` method which is shown below.

```
procedure TCCTrackBar.MouseMove (
  Shift: TShiftState; X, Y: Integer);
var
  r: TRect;
  pos: Integer;
begin
  inherited MouseMove (shift, X, Y);
  if fTracking
    and PtInRect (GetClientRect,
                  Point (X,Y)) then
  begin
    r := CalcTrackBarChannel;
    Inc(r.left, ThumbWidth div 2);
    Dec(r.right, ThumbWidth div 2);
    pos := ((X - 4 - FBorderWidth -
            (ThumbWidth div 2)) *
            LongInt(FMax - FMin)) div
            (r.right - r.left - 1);
    Position := pos;
  end;
end;
```

Although some Windows controls continue to 'track' wherever the mouse is on the screen, this isn't something that I find particularly appealing from an aesthetic point of view. Accordingly, the trackbar described here will only track the thumb position while the mouse is actually inside the control itself. This is the purpose of the `PtInRect` check in the above code. Once this determination has been made, the code then calculates the trackbar channel width and through a reversal of the equation used in the `CalcThumbRect` routine, maps the pixel position onto the corresponding logical 'position' of the trackbar. This is then assigned directly to the `Position` property of the control. Yes - a control can directly assign to its own published properties. In this case, assigning to `Position` will cause the compiler to generate a call to the private `SetPosition` method...

To blit or not to blit?

...and that is very bad news! With the code as it stands, every time you move the thumb slightly, you'll find that the control will flicker unacceptably. What is happening, of course, is that the `SetPosition` method is being called each time that the thumb moves. `SetPosition`, in turn, calls the `SetParams` method (see last month's code) which causes the control to be invalidated, causing a redraw of the entire control surface. No wonder it flickers!

How can we reduce this flickering? There are two different schools of thought. The first approach is to draw the control's surface into an off screen bitmap. Each time we want to redraw the control, we just blit the bitmap back onto the screen. In the current context - developing a trackbar - it would make sense to draw the control background into an off-screen bitmap, but omit the thumb from the bitmap. That way, each time the thumb moves, we could simply blit the background and then redraw the thumb in its new position.

Of course, this approach is not without its disadvantages. For one thing, we need to destroy the bitmap and recreate it whenever the control background becomes invalid. This is going to happen when the channel width or channel colour changes, when some aspect of the tick mark's appearance is altered, and so forth. It also goes without saying that - for performance reasons - it would make a lot of sense only to create this background bitmap when the control receives focus and destroy the bitmap when focus is lost. Without an important optimisation like this, you might have a 'audio mixer' window (for example), with ten or twelve different trackbars visible on the screen, each of which would have its own off screen bitmap sat there doing nothing. It's this sort of poor design which rapidly brings 16-bit Windows to its knees in terms of the dreaded system resource limits.

```
procedure TCCTrackBar.SetParams (APosition, AMin, AMax: Integer);
begin
    if AMax < AMin then
        raise EInvalidOperation.Create('Max less than Min.');

    if APosition < AMin then APosition := AMin;
    if APosition > AMax then APosition := AMax;

    if (FMin <> AMin) or (FMax <> AMax) then
    begin
        FMin := AMin;
        FMax := AMax;
        Invalidate;
    end;

    if FPosition <> APosition then
    begin
        FPosition := APosition;
        Invalidate;
        if Assigned (fOnChange) then OnChange (self);
    end;
end;
```

Listing 3 - The revised SetParams method

So what's the other technique? The classical approach to this sort of Windows programming problem is to redraw only those parts of the window which need to be redrawn. Since we've moved the thumb from A to B, we need to redraw the control's 'background' at position A and the thumb in its new position at B.

Whichever of these two approaches you choose depends on a number of factors. For example, how frequently is the off-screen bitmap likely to be invalidated? How much code complexity will be involved in 'housekeeping' the bitmap? If we only create the off-screen bitmap when the control has focus, then how do we repaint a non-focused control (as when a window becomes exposed)?

For our purposes, it's a far easier proposition simply to optimise the drawing code so as to redraw only what needs to be redrawn. After all, by using the `ExtTextOut` hack to draw tick marks and `Frame3D` for everything else, we've already ensured that our drawing code is no slouch. With a little thought to optimisation, we should be able to eliminate completely any trace of flicker from the user's point of view.

Listing 2 shows the revised, flicker-free, `MouseMove` method. Because we're no longer assigning to the `Position` property, the `SetParams` method is no longer being called from within `MouseMove`. This, in turn, means that we have to take responsibility for validating the new control position ourselves. This simply means that we need to 'pin' the position between `FMin` and `FMax`. Addition-

ally, the code checks to see if the position we're setting is the same as what we've already got.

Having done all this, the `CalcThumbRect` routine is called twice - once for the old thumb position and once for the new thumb position. In both cases, we use the standard `InvalidateRect` API call to tell Windows that these two rectangles need to be redrawn. And that's really all there is to it. With this simple change, you'll get smooth thumb tracking without a hint of flicker and without the need to keep updating a complex off-screen bitmap.

Adding custom events

So what do we do with our nice, smooth-tracking trackbar? Not a lot, as it stands at the moment! Currently, if you include the trackbar on an application form, how are you going to interrogate the trackbar to determine that it's `Position` property has changed? Set up a timer and poll it every few seconds, maybe? No - of course not. What's needed, of course, is the generation of an event when the trackbar's `Position` property is changed. The user can then install a handler for the event if he wants on-the-fly trackbar notification. Alternatively, if no on-the-fly effects are required and the form is simply a modal dialog, then the `Position` property of each trackbar on the form can be interrogated when the OK button is pressed. As always with components, the key word is flexibility - don't force the user of your component to do things *your* way.

Creating a custom event is very straightforward. For compatibility with the VCL library, let's call our new event `OnChange`. If you look at the VCL documentation, you'll see that many of the existing VCL components already support an `OnChange` event. If you were to derive a new component from any of those controls, implementing the `OnChange` property wouldn't be much more complex than just adding the following line to the `published` part of the class definition:

```
property OnExit;
```

This isn't an option for us because we've derived our trackbar component from `TCustomControl`. In other words, we've gone back in the class hierarchy to a point beyond the place where the `OnChange` event is first defined. However, defining our own custom event is very straightforward. First, add the following line to the `private` section of the class definition:

```
FOnChange: TNotifyEvent;
```

`TNotifyEvent` is a predefined VCL type which simply identifies `FOnChange` as a pointer to a notification procedure. The type is defined in the CLASSES.PAS file (part of the VCL source) like this:

```
TNotifyEvent =
  procedure(Sender: TObject) of object;
```

If you wanted, you could define your own procedural type, specifying any parameters which made sense for the type of event you want to create. However, for our purposes, the `TNotifyEvent` type is perfectly adequate. Now add a corresponding property declaration to the `published` section of your control's class definition like this:

```
property OnChange : TNotifyEvent
    read fOnChange write fOnChange;
```

The syntax of this property declaration looks very much like that of the 'ordinary', non-event properties that we've looked at previously. In fact, at this level, Object Pascal makes little distinction. It's only the fact that `FOnChange` is a procedural type, rather than a simple data item, which tells the compiler to generate special run-time data causing the `OnChange` property to appear on the Events page in the Object Inspector.

Having set up our new event type, we must ensure that `FOnChange` is initialised to `NIL` when the object is created. You can just set it to `NIL` in the `TCCTrackBar.Create` constructor routine. Failure to do this will cause the component to think it's got a valid procedure pointer when it hasn't. No need to elaborate on the consequences of this!

OK, so we've got an event handler all set up and ready to go. How do we 'trigger' it from inside the component code? Dead easy - this is what the syntax looks like:

```
if Assigned (fOnChange) then
  OnChange (self);
```

There are two places in the trackbar code where we need to make this call. The first, of course, is in the `MouseMove` method. Look at the `MouseMove` code in Listing 2. We need to add a trigger for the `OnChange` event immediately after the second call to `InvalidateRect`. We also need to trigger `OnChange` inside the `SetParams` method. A revised `SetParams` routine is shown in Listing 3. Incidentally, the call to `Assigned` is very important. It checks to ensure that the event handler address is valid (non-zero) and probably also calls the API routine `IsBadCodePtr` to verify that the handler is pointing at a valid code address. (I wasn't able to check this since I couldn't track down the `Assigned` routine in my VCL source code.)

With all this done, you can now easily hook into trackbar `Position` changes. A quick call to `MessageBeep(0)` is a good one for driving your workmates mad!

Summary

I hope you've enjoyed reading this three-part discussion on creating Delphi components as much as I've enjoyed writing it! I've deliberately built some shortcomings into this trackbar - in some ways, it's rather less than it ought to be. Part of the reason for this is that I want to encourage you to 'have a go' and start exploring Delphi components for yourself. The other reason is that I'm planning a new book on Delphi component writing (due in Spring 1996) which will go into a lot more detail on every aspect of component creation and will feature *(that's enough shameless plugging - Ed)*.

The two main shortcomings of the trackbar component as it stands are:

- The absence of an `Orientation` property, allowing you to have vertical and horizontal trackbars. I briefly discussed this last month, and gave some guidelines on how to create 'orientation-independent' code.

- A lack of keyboard handling. Ideally, while the trackbar has the focus, it should respond to Up, Down, Left, Right, Home and End key presses in a similar way to a scrollbar. Again, this would be very easy to put in - so do it!

Incidentally, if you want to go completely 'feature mad', then take a look at the slider component which ships with the excellent Perseus Visual Control Pack. You can download a preview (only works while Delphi is running) version of this control from the borland/delphi.files topic on CIX (PSSLIDER.ZIP). I think it'll give you lots of food for thought!

■

Dave Jewell is the author of "Instant Delphi" published by Wrox Press and "Polishing Windows" by Addison-Wesley. He can be reached as djewell@cix.compulink.co.uk.
The source for his slider control, EXETRKBR.ZIP, can be downloaded from the exe/files conference, ftped from ftp.exe.co.uk/exestuf/exetrkbr or obtained by mailing us a blank 3.5" disk with prepaid return mailer. The editorial address is given on the Contents page.

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Married to the Web

Can the web become an SQL browsing tool? **Paul Richardson** looks at the techniques available for interfacing SQL databases to the World Wide Web.

A great deal of data exists, throughout the world, in SQL databases. At the same time, more and more applications are being developed to be accessed via the World Wide Web. Two basic problems show up when trying to interface the Web to SQL. First, Web servers store the information to be served as flat-files, while SQL databases contain information that can only be retrieved using the Structured Query Language. Secondly, the results of an SQL query are only in plain text, and not marked up in HTML.

There are two outline solutions to this problem; both have their advantages and disadvantages. One is to perform bulk conversion of all the data into HTML files, and update the HTML pages as required. The other, and the one that we will spend the rest of the article looking at, is to use conversion or 'gateway' programs which perform the database retrieval and conversion on-the-fly.

The advantages of performing bulk conversion are that it is faster to serve the files, and that there's a comparatively low demand on the server's resources. However, the disadvantages are numerous: it is not very flexible; it requires extra disk space; there may still be the need for some form of Common Gateway Interface (CGI) program to produce the desired output; and, last but not least, it may get out of step with the database.

The 'on-the-fly' conversion technique has the disadvantages that considerably more CPU cycles are eaten up and that as a result of the additional step, there will be a delay. But the advantages are worth the extra resources. It is very flexible. The data served is always aligned with the database. And no extra disk space is required

Database to WWW gateways

Tools exist to interface a wide variety of databases to the Web. Unfortunately, as far as I know, there's no way to interface the Web to *any* generic middleware product. This means that despite having a common query language, ie SQL, a program has to be tailored for each database, since they all have different APIs. So, software vendors get your act together, give us a generic product, or if you already have one, let us know.

GSQL

I have chosen *GSQL* to illustrate the techniques used in interfacing SQL to the Web, because it's relatively straightforward and has support for a number of databases - hence I can't be slated for favouritism.

The core of the GSQL system is a program which parses what is called, in GSQL parlance a PROC file, and generating an HTML form which, in turn, is sent to the browser. The same program, when called with a query from the browser will interrogate the PROC file in order to build an SQL query for the database. See Figure 1 for a graphical illustration of GSQL's operation. The C code of GSQL appears to be fairly portable: I successfully compiled and used it under a version of Unix as well as MS-DOS, without too much trouble.

It is helpful to think of a PROC file as a high-level HTML file that allows HTML to be embedded, as well as specifying things like:

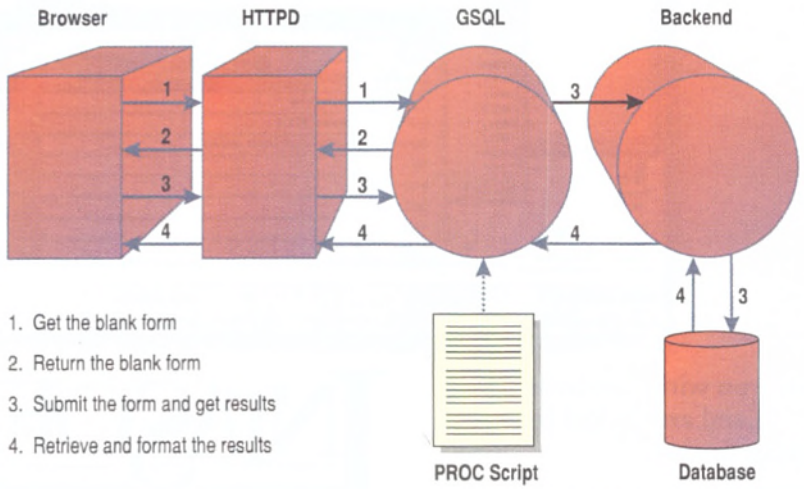

Figure 1 - GSQL's browser-server dialogue

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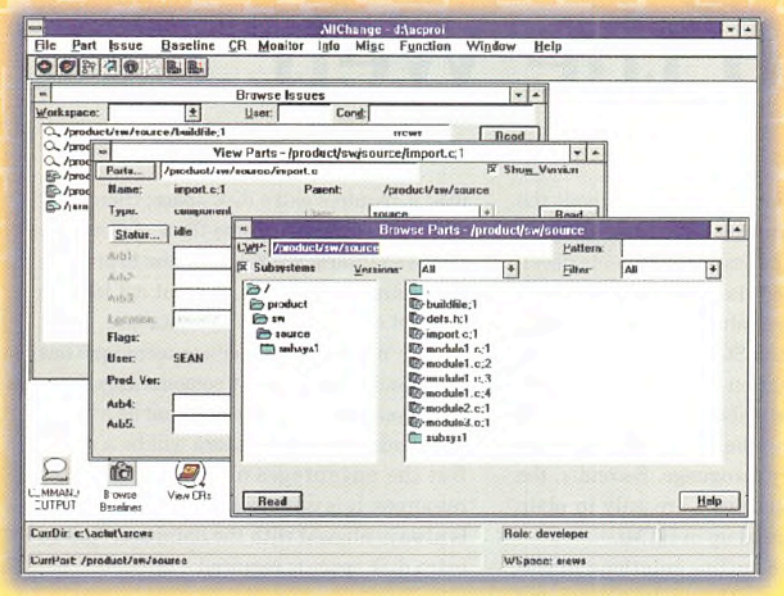

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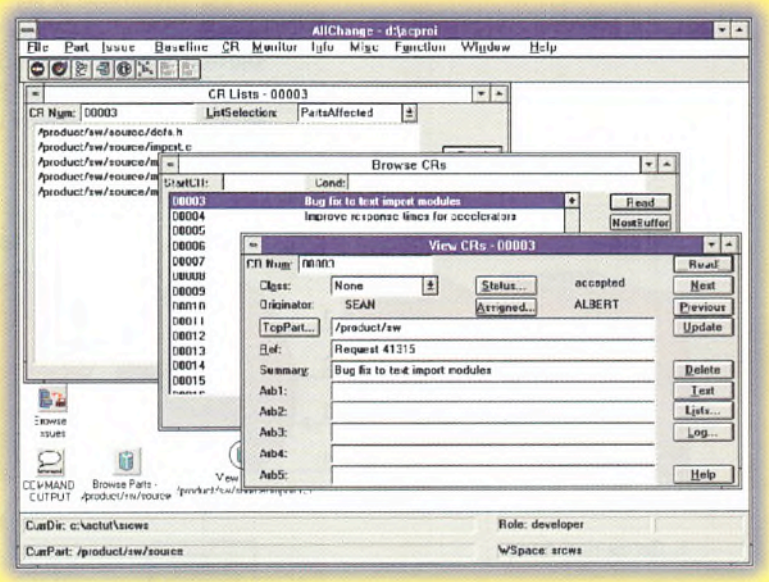

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- The path to the custom back-end program that will run the query.
- A number of user-defined strings that can be passed to the back-end program, for instance, a logon name and password for the database (hence the PROC script has to be secure).
- The input fields that are to appear on the HTML form.
- The relationship between the values that the user enters in the HTML form's fields and the values in the SQL `WHERE` clause.
- The name of the table to be queried and the columns that are to be returned.
- The sort order in which the records are to be returned.

The use of GSQL is demonstrated in this article by a simple job vacancy database that allows searching by region, skills and salary.

In Figure 2, we can see the PROC file used for this example, while Figure 3 shows the HTML generated by GSQL using this PROC file. Figure 4 is a screen capture of the HTML when viewed using Netscape.

Keywords

There are a number of keywords that appear in PROC scripts, most of which can be seen in use in the example file. I will now discuss some of the most interesting ones.

The `TEXT` keyword allows free-form text or marked-up HTML to be inserted at any point in the PROC file. The GSQL executable will output the text of a `TEXT` line untouched at the point where it appears in the script.

The `SUB` keyword is really at the heart of what GSQL does: it indicates how the values that the user types in to the HTML form should be used to form the `WHERE` clause of the SQL query. The `$` at the end of the `SUB` statements represents the typed-in value, and hence the value in the `WHERE` clause. Several `SUB` lines can be used, as in the example, to form a multi-part `WHERE` clause.

The `SHOW` keyword indicates which fields should appear in the HTML form. A title is provided which can contain HTML tags, and is used as a caption for the field. The field can

```
# ------- Preamble ----------
TEXT <P><H3>Query the job vacancy database using the form below.</H3>;

# ------- Set up WHERE clause using user input --

SUB region WHERELIST AS geography = '$';
SHOW region TITLE "Select one or more regions:<BR>" SCROLL South East, South West
      , East Anglia, Midlands, North East, North West, Wales, Scotland, London;

SUB salary WHERELIST AS dough like '$';
SHOW salary TITLE "<P>Choose your required salary:<BR>" RADIO £10000-15000
      , £15001-20000, £25001-30000, £30001-35000, £35001-40000;

SUB expertise WHERELIST AS skills like '$';
SHOW expertise TITLE "<P>Enter a skill to search for:<BR>" FIELD;

#------- Now provide a few more essential details -

SQLPROG    /usr/local/etc/gsql/bin/jobsrch;
FROMLIST   jobs;
SELECTLIST geography, salary, expertise, details, contact;
SORTLIST   order by salary desc;

DEFINE  LOGIN prichard;
DEFINE  PASSWORD not-telling;
DEFINE  ORACLE_HOME=/usr/local/oracle;
```

Figure 2 - An example GSQL PROC script

```
<H1> GSQL: a Mosaic gateway to SQL databases </H1><HR>
<FORM>
<H3>Query the job vacancy database using the form below.</H3>
Select one or more regions:<BR> <SELECT NAME="region" MULTIPLE>
<OPTION SELECTED>  South East
<OPTION>  South West <OPTION>  East Anglia <OPTION>  Midlands
<OPTION>  North East <OPTION>  North West <OPTION>  Wales
<OPTION>  Scotland <OPTION>  London
</SELECT>
<P>Choose your required salary:<BR>
<INPUT TYPE="radio" NAME="salary" VALUE="£10000-15000"> &#163;10000-15000
<INPUT TYPE="radio" NAME="salary" VALUE="£15001-20000"> &#163;15001-20000
<INPUT TYPE="radio" NAME="salary" VALUE="£25001-30000"> &#163;25001-30000
<INPUT TYPE="radio" NAME="salary" VALUE="£30001-35000"> &#163;30001-35000
<INPUT TYPE="radio" NAME="salary" VALUE="£35001-40000"> &#163;35001-40000
<P>Enter a skill to search for:<BR>  <INPUT NAME="expertise">
<P> <INPUT TYPE="submit" VALUE="Doit!"> <P>
</FORM>
```

Figure 3 - The HTML output from GSQL

Figure 4 - HTML code of Figure 3 viewed with Netscape

be of any type allowed under the HTML 2.0 forms specification. The types used in the example are `RADIO`, `SCROLL` and `FIELD`, where `FIELD` is just the basic text input type.

The `SQLPROG` keyword specifies the path of the back-end program that should be run when GSQL is called with a query.

The `FROMLIST` keyword indicates which table in the database the query is to be made against.

The `SELECTLIST` keyword allows the user to choose the list of columns to be returned from the database in the results.

The list of column names after the `SORTLIST` keyword dictates the order in which the records will be returned from the database.

The `DEFINE` keyword allows the definition of name/value pairs which are passed to the back-end program.

What GSQL does *not* do for you is format the SQL results as they come back from the database. You have to write a custom program for the specific database that you are using. Sample back-end programs are provided for Oracle, Sybase and Interbase.

The custom back-end programs must send the SQL query to the database, collect the SQL results, format the results in HTML and output the generated HTML to the standard output.

The GSQL executable passes three types of arguments to the back-end program: the executable name in `argv[0]`, the SQL query in `argv[1]`, and 'user-defines' in `argv[2]`, `argv[3]`... User-defines are of the form `name=value`, for example `USER=jason`.

The C back-end program in Figure 5 illustrates these steps. There are a couple of utility routines supplied with GSQL to assist the task of writing back-end programs. One of them, `app_parseargs()`, is used in the example to parse the arguments to the program, such that other routines can get the value of any argument just by giving the argument name.

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References

SFGate - a freeWAIS to WWW gateway	ftp://ls6-www.informatik.uni-dortmund.de/pub/wais/
Freetext search For Web (FFW)	http://www.nta.no/produkter/ffw/ffw.html
Oracle WWW Interface Kit	http://www.oracle.com
Sybase's WWW Resources	http://www.sybase.com
GSQL	http://www.ncsa.uiuc.edu/SDG/People/jason/pub/gsql/starthere.html

GSQL has several deficiencies, two of which are worth mentioning:

i) It makes use of the HTTP `GET` method rather than the more capable `PUT`. It may be that in some server implementations there is a limit to the complexity of the query that can be formulated by GSQL.

ii) It is rather sensitive to changes in the schema. The PROC file is tied to the schema quite tightly and hence is likely to have to change in step with changes to the schema. Other tools are available that use scripts written in a meta-language more independent of the schema.

Vendor specific

Other database-to-Web tools exist, specific to the following databases: Oracle, Sybase, Ingres, Informix, Interbase, and Wide Area Information Servers (WAIS).

Conversion software

Wide Area Information Servers (WAIS) can be very useful for indexing large amounts of free-format text. While many Web browsers can access WAIS directly, if it is felt necessary to provide access to all types of browser, you may like to look at *SFGate*, which is a free WAIS to WWW gateway. To get more information on SFGate or any of the other tools mentioned, check out the URLs in the References box.

An alternative freestyle indexing and searching tool is *Freetext Search For Web* (FFW). FFW has the additional feature of recognising and helpfully ignoring HTML tags. It can build indexes incrementally and allows simultaneous multiple index searches.

If you are looking to use an Oracle database then a bewildering array of alternatives are available. Oracle has made a big splash on its WWW site with the *Oracle WWW Interface Kit*. In reality, it has little to boast about, as it's not much more than a cobbled-together collection of freely available software. But I'm sure that it marks a commitment to Web technology and that it will be followed by commercial products.

There are a number of components in the Oracle kit. The *Decoux* package makes use of a template form which gives the format for the SQL results within an HTML context. The *oraywww* tool is a Perl script for generating HTML forms, for later use. Oracle itself has contributed a PL/SQL, Procedural Language with embedded SQL, interpreter and compiler. PL/SQL has some extensions which makes it suitable for use with the Common Gateway Interface (CGI).

This kit is heavily Perl-oriented. It comes with a package called *oraperl* which contains a library of Perl functions for interacting with Oracle databases. It is possible to write the custom aspects of the development in various languages and to 'talk' to the database at a variety of levels; ie in PL/SQL, PROC or Oracle Call Interface (OCI).

It appears that the best supported platform for use with the Oracle kit is SunOS 4.1.3; your mileage may vary on another platform. One other point to bear in mind is that it is entirely feasible to put the database on another machine and use Oracle's SQL*Net to communicate to and from the Web server.

Sybase is also well clued-up on Web integration and it's worth visiting its Web site. The main tools promoted by Sybase are *FDB*, *Genera* and *Sybperl*.

FDB is rather like the *GSQL* package. It is a Sybperl (Sybase's equivalent of Oracle's oraperl) program which takes a definition script and generates an HTML form on-the-fly. It also comes with programs to interrogate databases and produce a template script.

To close

These are still pioneering days in the Web-to-SQL database gateway field, but as is evident when browsing some existing Web sites, good-looking, robust solutions are available today. A new niche software market is being born, and I think we can expect the 'custom' element of these software to be reduced as, inevitably, point-and-click tools come to the market. ■

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

This article covers the presentation Paul Richardson gave at the EXE '95 Software Developers' Show.

```
struct record {
   char geography[MAX_GEOGRAPHY + 1];
   char salary[MAX_SALARY + 1];
   char expertise[MAX_EXPERTISE + 1];
   char details[MAX_DETAILS + 1];
   char contact[MAX_CONTACT + 1];
} records[MAX_RECORDS];

main(int ac, char *av[])
{
   int i, num_records;
   char* sqlstring = NULL;
   char* sql_results[MAX_SQL_RESULTS + 1];
   app_parseargs(ac, av);  // supplied in sqlutil.c
   sqlstring = strdup(av[1]);
   execute_sql(sqlstring, sql_results);
    // This routine specific to your database type
   num_records = parse_results(sqlstring, records);
    // Put results into struct record
   output_results(records, num_records)
}
```

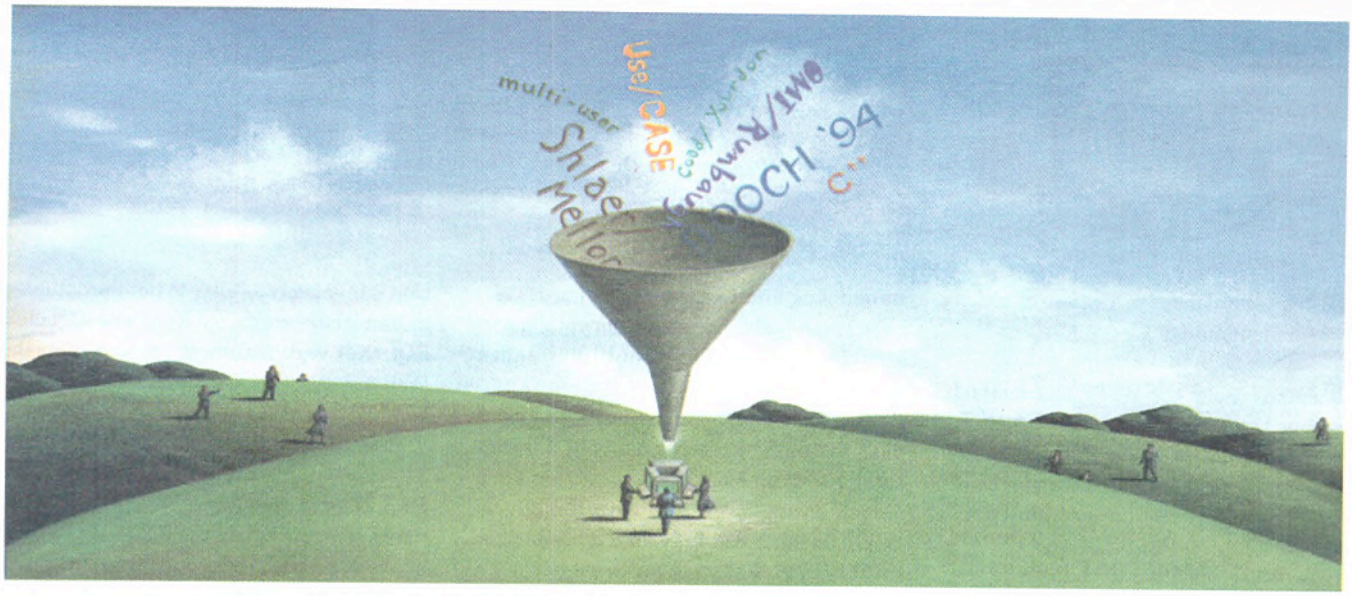
```
void output_results(struct record records[], int num_records)
{
   printf("<H1>Results of Job Search</H1>");
   printf("The following books matched your search criteria:<P>\n");
   for (int x = 0; x < num_records; x++)

   {
      output_record(&records[ x ]);
   }

    printf("Thank you for using Job Search<HR>");
}

void output_record(struct record* rec)
{
   printf("<STRONG>Skills: </STRONG>%s<BR>\n", rec->expertise);
   printf("<STRONG>Region: </STRONG>%s<BR>\n", rec->geography);
   printf("<STRONG>Salary: </STRONG>%s<BR>\n", rec->salary);
   printf("<STRONG>Details: </STRONG>%s<BR>\n", rec->details);
   printf("<STRONG>Contact: </STRONG>%s<P>\n", rec->contact);
}
```

Figure 5 - A back-end program example



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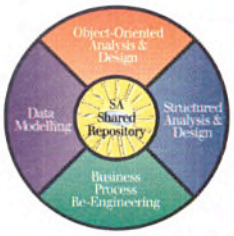

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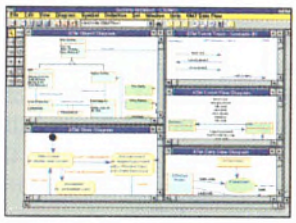

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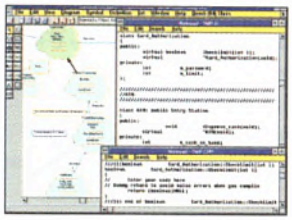

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Bugs & patterns

After playing at 'Spot the bug', **Francis Glassborow** presents his view on the relevance of 'patterns' for the C and C++ programmers.

How good is the standard of C coding among professional programmers? Not nearly as good as they and their employers like to think if my recent experience is anything to go by. I published some bugged code in the last issue of *C Vu* (the Journal of the ACCU) along side an inexperienced programmer's commentary. It generated a large number of responses. Their quality has been variable to say the least. For example, have a look at this fragment of C source code and determine what it actually does. Compare that with what it is clearly intended to do. I will highlight the main bugs at the end of this column but there are a

```
void fn(int *array, int size, short adjust){
  int over = size|3;
  int repeats = size >>3;
  int count;
  assert (array);
  assert (size>0);
  if (adjust ==0) return;
  for (count = 0; count< over; count ++)* array ++ += adjust;
  for (count = 0; count < repeats ; count++){
    *array++  += adjust;
    *array++  += adjust;
    *array++  += adjust;  /* loop unrolled for
    *array++  += adjust;  /* greater speed
    *array++  += adjust;  /* by reducing many loop
    *array++  += adjust;  /* calculations */
    *array++  += adjust;
    *array++  += adjust;
    *array++  += adjust;
  }
  return;
}
```

couple of things worth noting in passing. Both C and C++ provide `size_t` by a `typedef` (or perhaps via the pre-processor). It is intended for use where the size concept is valid and hence negative values would be unsuitable. It is used for recording the sizes of objects and similar things. The consequences of using it can be surprising. I think that these surprises should be better understood. I frequently have to defend my code from code inspectors who want me to replace `int` parameters by `size_t` ones on the basis that I am managing a size concept. They would criticise my use of '`int size`' in the above code because `size` is meant to be the number of elements in the array pointed to by the array parameter. Consider the following short program:

```
#include <iostream.h>
#include <assert.h>
void fn(int s) {
  assert (s>0);
  for(int i=0; i<s; i++){
    cout <<i<< " ";
    }
    cout << endl;
}
main () {
    fn(-1);
    return 0;
}
```

With or without the assert this compiles and runs. With the assert you will get an assertion failure, without it you will get a program that ends normally after outputting only a blank line.

Now replace the '`int s`' by '`size_t s`'. Do not run the result unless you are willing to interrupt it as the program will enter an infinite loop on most implementations.

Despite their use in the Standard C Library, `size_t` parameters are almost certainly an error because they will hide a problem from any form of runtime check.

By the way, I wrote the above program in C++ because in my first version I also outputted `s`. I could find no reliable way of doing this with `printf()`. Try it yourself.

The built in high level I/O functions of C are poorly suited to typenames provided via `typedef`s. In the case of user-defined `typedef`s the user can, in theory, do something about it. Those typenames provided as part of an implementation are rather more awkward as many programmers think they are free standing types.

Patterns

Some time ago I promised that I would write something about 'patterns for software architecture' or simply 'patterns'. The idea of encapsulating certain design wisdom as a named pattern was triggered by the book *The Timeless Way of Building* by Christopher Alexander (Professor of Architecture at the University of California at Berkeley and Director of the Centre for Environmental Structure).

A group of software specialists (James Coplien et al) realised that much of what Alexander was saying about the fundamentals of building architecture had relevance to software architecture and so the pattern movement started. Unfortunately it is still in its infancy and most if not all the first generation books are marred by jargon and the implicit expectation that readers will quickly grasp the use of building analogies.

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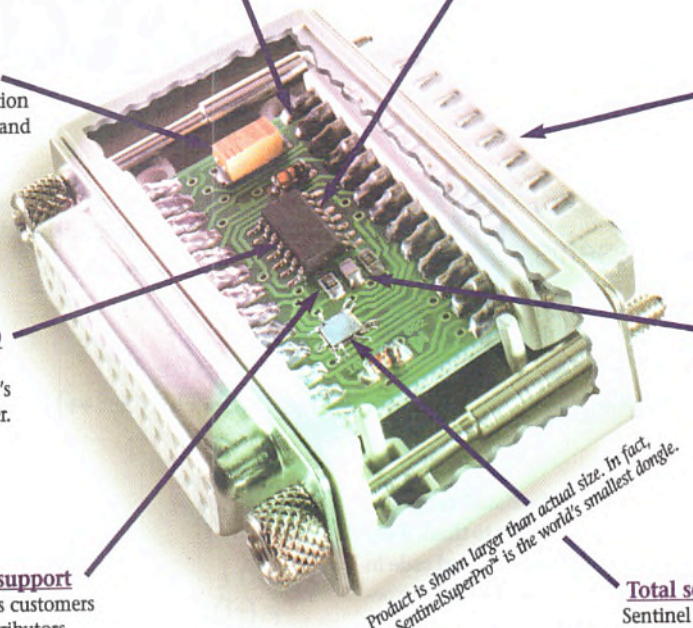

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I take a very dim view of those who expect working 'software engineers' to take time out to read a book on the architecture of buildings. I think Alexander's book is worth reading but I do not think it is a prerequisite for studying 'patterns in software architecture.'

The second problem facing many readers without prior knowledge of the subject is a sense that the material in books such as *Design Patterns - Elements of Reusable Object-Oriented Software* by *Erich Gamma* et al are no more than common sense. In so far as 'common sense is one of the rarest of human attributes' this has some truth in it. Patterns seek to encapsulate the wisdom of experienced software designers in ways that make it accessible to the less experienced as well as to provide a vocabulary for communicating and discussing design ideas. Naming things makes them accessible for use.

One problem with the *Design Patterns...* book is that it mistakenly ties the pattern concept to object-orientation. There may be a symbiotic relationship between the two but no more than that. The design concepts in high level patterns are as remote from object-orientation as Alexander's patterns are from modular building technology.

Let me take one common pattern as an example, that called 'Publisher-Subscriber'.

This pattern encapsulates the problem of modifiable data being accessed by an unknown number of program entities. Unknown, that is, by the author of the code that manages the data. The entities that rely on the data (perhaps several windows displaying text) must be notified of any change so that each can act appropriately. The subscribers should be able to act on the assumption that data has not been changed unless informed otherwise. There are many instances where this kind of dependency must be handled by a programmer.

The less experienced programmer sees every instance as a new problem to be solved. The reuse fanatic tries to write code that handles all cases - a hopeless task. Experienced programmers capitalise on their experience to help direct them to the code that needs to be written.

The 'Publisher' entity must keep a list of subscribers, support a mechanism for notifying change and manage the process of propagating that change.

The list of subscribers is very like that for a magazine or electronic mailing list. Individuals must be able to subscribe to the list (register) and they must be able to remove themselves from the list (de-register). The publisher must maintain the list because no-one else can.

The subscribers must provide a method for being notified of change. In simple cases the same type of notification will apply to all subscribers. For example, they might have a state variable that can be changed by the Publisher when a change occurs. At other times they might have a local copy of data that the Publisher can update for them, or provide a method by which the Publisher can dispatch an update to them. The analogy with software publishers and updates is a pretty good one.

A bad software publisher leaves me to discover that I need an update. The better ones notify registered users of updates and some provide a mechanism by which I will automatically receive updates.

The 'Publisher-Subscriber' pattern does not provide me with a specific code level solution. What it does is to focus my attention on a range of solutions sketched in sufficient detail so that I can implement one for the specific problem facing me. It shows me how to minimise the coupling between entities maintaining data and a variable number of entities using the data. It provides me with designs for propagating change.

Generally patterns do not provide solutions at coding level but aim to focus your thought on an overall approach to a particular type of problem. They are intended to help identify specific types of problem in software and hence de-couple them from other aspects of design.

Patterns also exist at many different levels of design and some will be largely language specific. For example, C and C++ have uses for memory management patterns that would be quite irrelevant to languages such as Smalltalk and Eiffel. Such things as Coplien's 'Counted Pointer' are important to minimise unnecessary copying in C++ but are inappropriate to languages supporting garbage collection (of course such languages have their own drawbacks).

Good, well documented patterns are important for improving programming skills. Without them programmers must gain wisdom for themselves, through patterns experience can be communicated and shared. They also help programmers document their intentions in a specific design which makes maintenance easier.

Those faults

Time to look back at the code at the beginning of this column. Consideration of the code suggests that the programmer intended to partially unroll a loop. First the two lower bits of `size` are extracted into `over` (at least, they would be if the author hadn't confused AND and OR). Then the bit pattern is shifted right by three bits.

That cannot be right. Surely the three low bits should have been extracted. I know division operations are very inefficient, but if a remainder and quotient are to be hand-coded the programmer needs to take more than normal care.

Now what about the loop where the bulk of the work is done. Clearly the programmer has mis-counted, but how many times per iteration is '`*array++ += adjust`' actually executed. Eight was, presumably, the intent, and nine is an illusion. How many are there? Go and count again.

Of course, the C++ style comment eliminates this kind of problem, as does the use of editors that support colour-coded syntax.

A final thought on mixing C and C++ style comments. What should a compiler do with:

```
/* this is a comment
// that may or may not end here */
```

No problem until you opt for nested comment support as provided by most of the IDE based packages. Then what? ■

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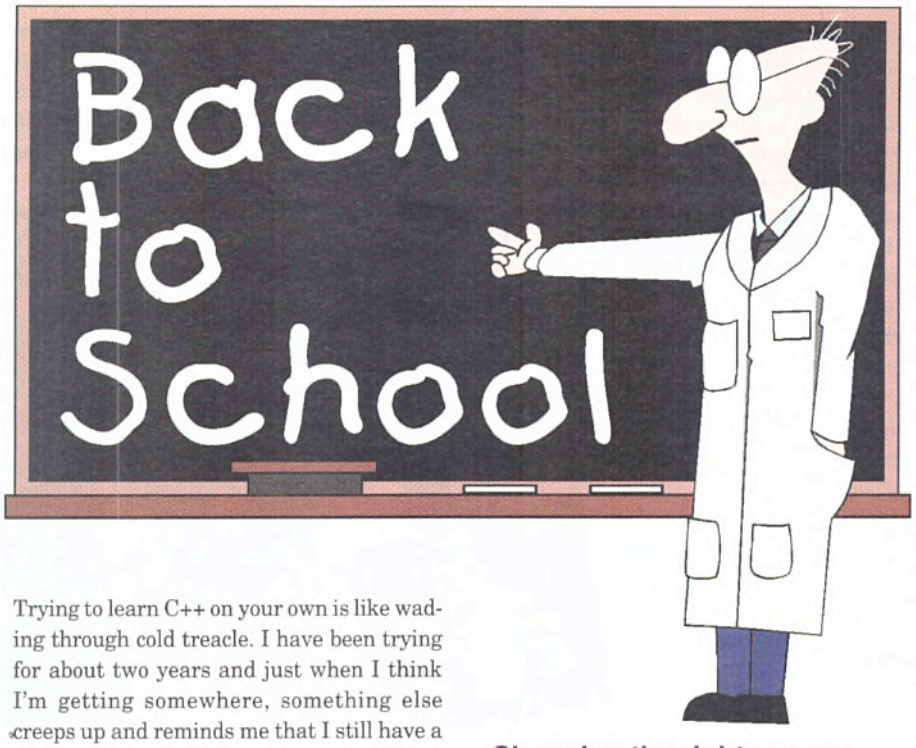
After two years of evenings spent learning C++ in his bedroom, **Graham Kendall** decided to get the topic onto his CV once and for all by investing in a computer training course. Read on to see if you too could benefit...



Trying to learn C++ on your own is like wading through cold treacle. I have been trying for about two years and just when I think I'm getting somewhere, something else creeps up and reminds me that I still have a long way to go. I thought I might have cracked the language when I understood copy constructors, operator overloading and protected class members, only to be suddenly confronted with templates, pure virtual functions and deep discussions on class hierarchies with regard to object-oriented programming.

To try and stop this never-ending cycle I decided to attend a five-day *C++ and Object Orientation* course. It would cover most of the language so that, even if I understood nothing, at least I would know how far I had to go. I also thought that a five-day course would look better on my CV than a line that proclaimed 'self-taught'.

Choosing the right course

I plumped for Kibworth Computer Training because of the low number of students on each course - three or fewer. Also, the course is tailored as you go to suit the skill levels and interests of the people attending. For example, an understanding of C is assumed, but if it is found that your C is a little suspect the course can spend more time than it normally would on this language. Of course, it helps for people with about the same level of experience to attend the same course and KCT tries to make sure that this is the case when you book.

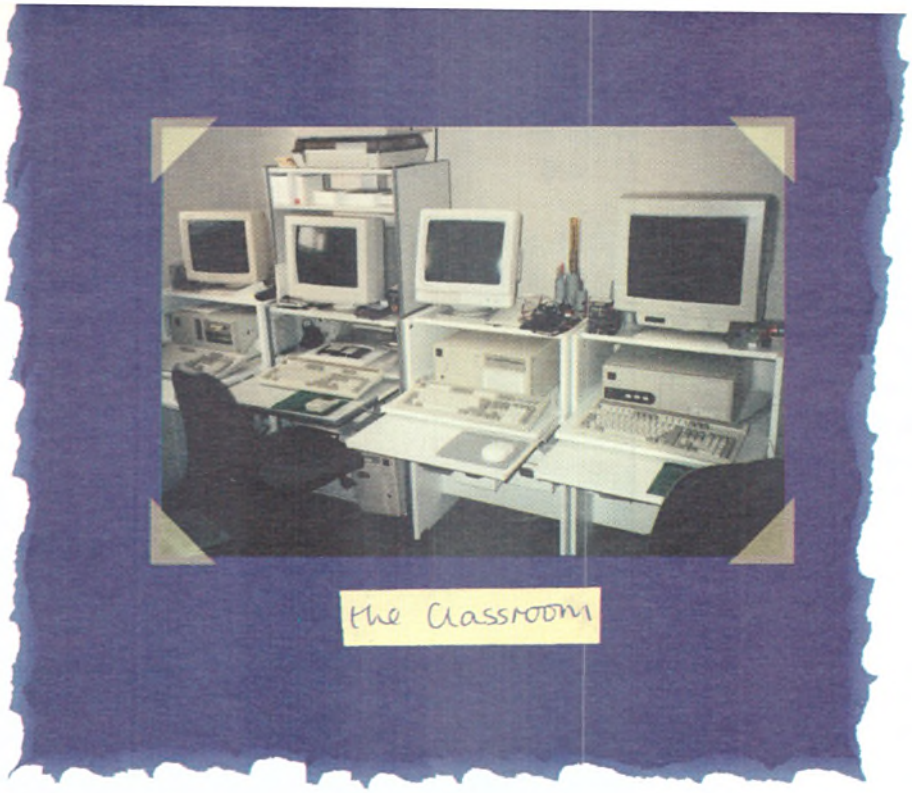
I told KCT that my C was satisfactory but by no means strong and that I thought I had a reasonable understanding of C++. I added that my main reason for attending was to check that my understanding of various topics was correct and to ask lots of questions. My course turned out to be a two-man affair. Luckily, both Richard Davis and I had similar skill levels.

my teacher, Eric and fellow student

First day nerves?

After the introductions we covered the major differences between C and C++ and, in broad outline, Object Orientation. This initial session was both educational and an opportunity for Eric Richards to find out how much we knew so that he could pitch the course at the right level.

We were asked if we had any particular problems or aspects of the language we would like to cover. Both Richard and I came up with a similar list including I/O streams and templates. In addition Eric suggested that we also cover the Standard Template

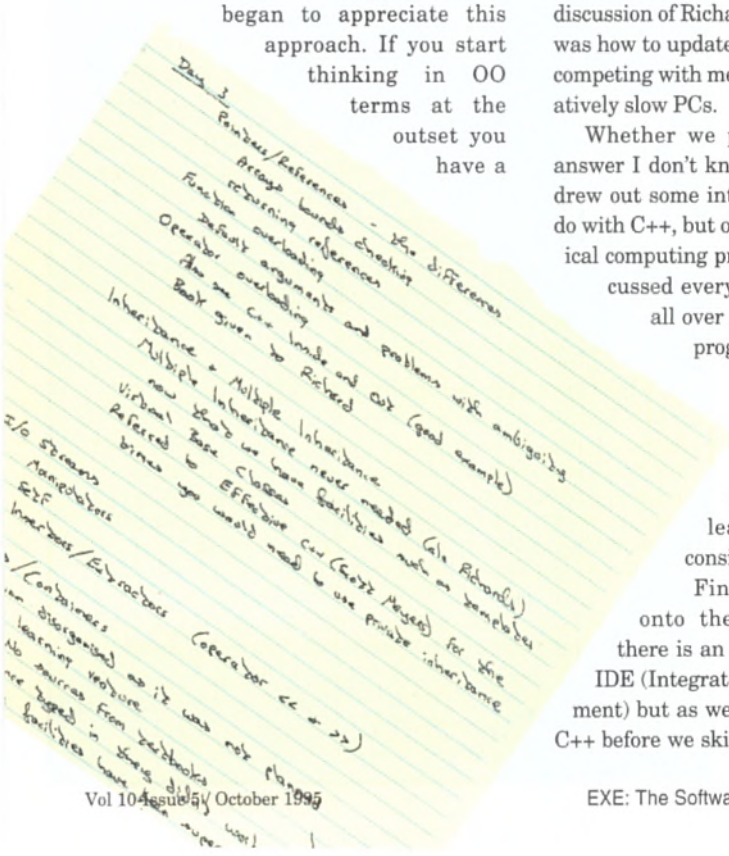


Library as this will soon be an important addition to the ANSI standard.

Following the introduction to OO we did a session on Analysis and Design. It explained the differences between Types and Classes and introduced the concept of operator overloading. We also looked at the difference between *is a* and *has a* when you start to model the real world.

The method behind...

At first I wondered why we were having conversations about analysis and design so early on, thinking that it would be better to get the language syntax under my belt first. In fact, as the week progressed, I began to appreciate this approach. If you start thinking in OO terms at the outset you have a better chance of understanding what C++ is trying to achieve.



The introduction to analysis and design continued with Scenarios and Use Cases. This gave us an understanding of how a complete process can be viewed as a series of events that take place over time. Then we ended the first session with a look at Entity Life Histories and were given a suggested method for documenting an ELH which can also be used to document a program.

Lap two

The afternoon switched from theory into the deeply practical. We had both been asked to bring a problem with us. So we began with a discussion of Richard's 'dilemma'. In short it was how to update a remote database while competing with memory limitations and relatively slow PCs.

Whether we provided a satisfactory answer I don't know, but the conversation drew out some interesting points, many to do with C++, but others concerned with typical computing problems that must be discussed every day by IT departments all over the country. As the week progressed some of the problems that had been raised were given a further airing. There are, of course, no magic answers but I think we learnt something just by considering the problems.

Finally, it was time to get onto the computers. Normally there is an introduction to Borland's IDE (Integrated Development Environment) but as we had both used Borland's C++ before we skipped this section. For the record we were using version 4.5 which is an important consideration if you want to explore some of the later additions to the language which may not be present in earlier versions.

Around C++ in a day

This first practical session made me feel like we had covered just about everything the language had to offer, although really we had only just scratched the surface. In just one afternoon we touched on encapsulation, function overloading, inheritance, polymorphism, polymorphism versus function overloading and I/O streams! This was followed by a number of exercises which tested our understanding of these subjects. Then to end day one we started to look at constructors and destructors... no peace for the wicked.

Exercise as you go

After the discussion on the first day about the areas we specifically wanted to look at, Eric presented us with a revised course schedule that emphasised I/O streams and templates. Both Richard and I were happy with the changes. First, however, we still had constructor initialisation lists, garbage collection and inheritance to cover. The teaching was sprinkled liberally with exercises which ranged from the simple to the complicated and are shown in Figure 1.

In the afternoon, we started to deviate from the published schedule with the video *Beyond the World of C++* presented by Bruce Eckel. It was like looking over his shoulder while he explained the topic by demonstrating a series of programs. We watched Lesson 3 which covered I/O streams and some of the more advanced things you can do rather than just using them for `cout` and `cin`. It helped me realise the deeper possibilities of streams which I shall definitely be investigating further.

On returning to the main course we covered another list of topics, again using exercises to test our understanding. This time we touched on pointers to objects, the relationship between structures, classes and unions, and in-line functions. We moved on to copying objects by using copy constructors and overloading the `operator=` function, friend functions and finally arrays, pointers and references. Before we came on the course I wouldn't have believed that we could have covered all these topics in just a couple of hours. But they weren't as frightening as they first appeared and, once explained, I wondered why I had been worried about them.

Overtime

That was the official end of the second day but we did some overtime and started to look

- Write a program that prompts for the amount an employee is paid per hour and the number of hours they have worked. Calculate and display the gross pay.
- Create a circular queue that holds integers. Demonstrate the queue via a suitable `main()` function.
- Create a class called `stopwatch` that has member functions called `start()` and `stop()`. Once started the watch should keep track of time. If it is stopped the current time should be displayed. The destructor function should also display the elapsed time.
- Create a base class called `shape` and derive two other classes from it (`rectangle` and `circle`). Give each of the derived classes a function called `area()` that calculates the area of the respective shape.
- Write a program that maps an `int` and a `char` array onto the same memory (a union). Read in an integer and then display the value as a series of binary digits.

Figure 1 - sample exercises from the course

at the Standard Template Library (STL). This is a new library that is soon to be incorporated into standard C++. Essentially it is a set of classes donated by Hewlett-Packard which takes the concept of templates one stage further. Our first introduction to STL was a video by Silicon River. We watched the first hour which explained the concepts behind STL. I thought it was tough going.

Another day another video

On the third morning we covered pointers, references, function overloading, operator overloading and inheritance, with exercises. It is interesting to note that many people think that multiple inheritance (MI) is never needed now that we have facilities such as templates. This view was given by our lecturer and later, on video, by Bruce Eckel who said that if templates had been introduced into the language before MI, then MI would probably not be part of the language.

After lunch we looked at streams, covering basics such as manipulators and writing your own inserters and extractors for your classes. I did find this afternoon a little disorganised. At one point we were trying to implement a 'bag' container and we ran into all sorts of problems. However, we got it working eventually and I think you do learn from the mistakes you make.

Because we had requested to cover extra topics we worked past five again this evening. Tonight it was a continuation of the Silicon River video. I'm glad to say that this session was more practical and we learnt how to use the STL to create and iterate over various types of container.

Template for progress

The plan for Thursday was to use some of the knowledge we had gained from the videos to implement an STL container. We thought it would take a couple of hours. In fact, it took us most of the day to get the thing working and, even then, it was the simplest type of container (a vector) which we could only traverse in a forwards direction. But in getting it working we learnt one hell of a lot about STL and also realised how far we still had to go.

Friday started with another serving of Bruce Eckel and *Beyond the World of C++*. This time he was telling us about templates. The remainder of the morning was given over to completing the official course by covering virtual functions and discussing their importance with regards to OO programming. I now understand why people say that if you don't know what the `virtual` keyword does then you don't understand OO programming.

The final few hours of the course were spent working on a project of our choice. I decided to develop a template program which started off with a container of type `bag` which held integers and ended up as a bag of pointers to instances of a user-defined class. Richard cracked a template problem that he had brought to the course with him and also wrote a class that incorporated a doubly-linked list.

Didn't he do well

The first thing I learnt from the course was that the last two years' study had not all been in vain. It was the fact that both Richard and I already had some understanding of C++ that allowed us to fit in so many other subjects.

The course comes with a manual which explains each subject and provides the exercises. This manual is provided by a company that writes courseware for other people to use. In addition there was a lot of handouts. These are different for each course as Eric gives you anything which he feels will be useful. On this course we received a glossary of OO terms, sample programs from the videos, and further information on streams, to name but a few.

Eric has a large library of books which we made good use of to answer specific questions or to gain a bit more background knowledge of certain subjects. It was nice to have different teaching aids. It helps to start the afternoon in a relaxed manner by watching a video. The only complaint I would have is that the training room is a little cramped at times. Maybe it was worse for me as I was trying to do the course as well as make notes for this review but a little extra working area would not have gone amiss. ■

Kibworth Computer Training is based in Kibworth Beauchamp near Leicester. The 5 day course costs £1,050 (+VAT) and is run from Eric Richard's home. Lunch is provided as part of the course and is taken at a different local pub each day. I stayed in a local Bed-and-Breakfast at £20 a night. At the end of the course each student receives a book that it is applicable to their needs. I was given Effective C++ *by Scott Myers. Richard Davis was presented with* C++ Inside and Out *by Bruce Eckel.*

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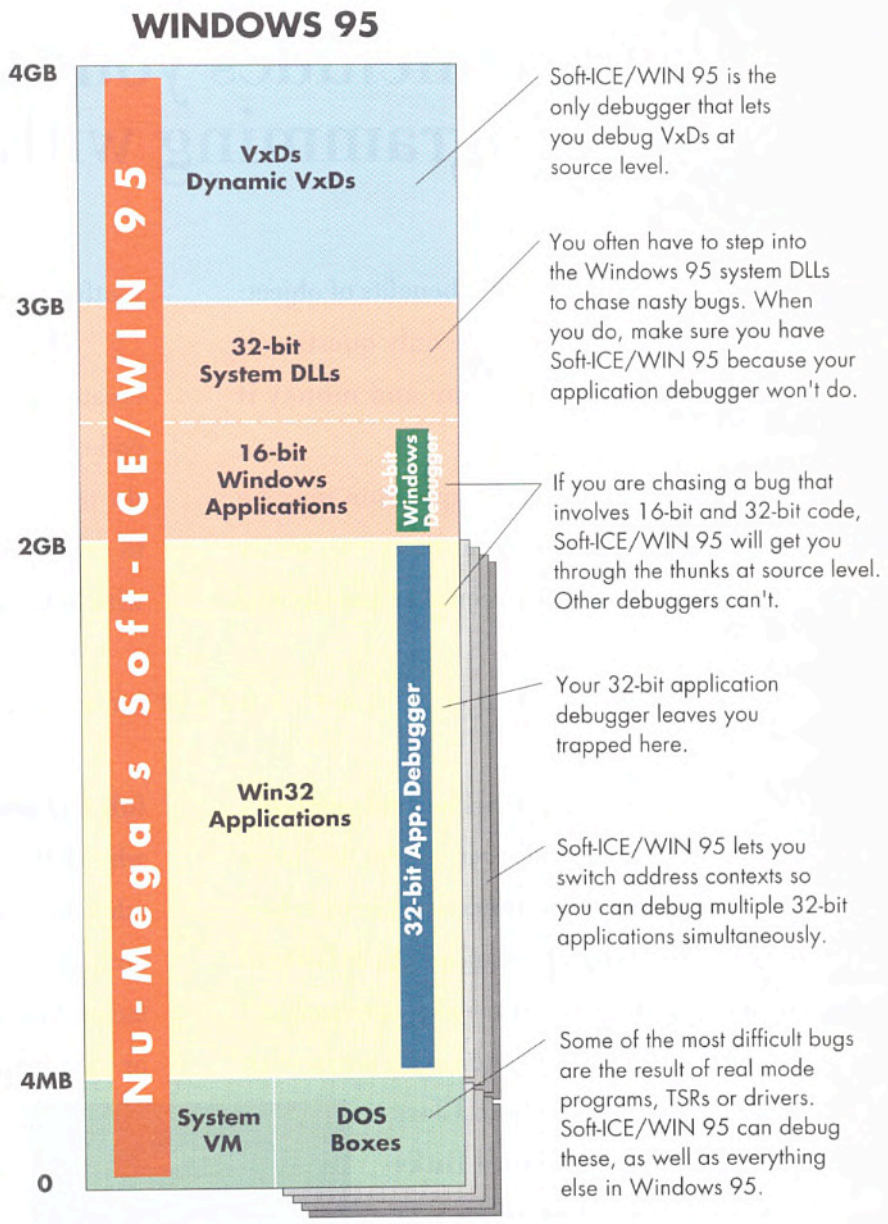

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M·E·M·O·R·A·N·D·A IN X·B·A·S·U·M

Born as a bit of an Ashton-Tate kludge, the xBASE memo has evolved and proliferated. **Colin Hume** picks his way through a forest of formats.

The xBASE DBF format has become an established data storage standard, used not only by the various flavours of xBASE itself but also by a diverse range of other products including accounting packages and CASE tools. Data is stored in a DBF in fixed-length fields, so that space has to be reserved whether it is used for storage or not. This is not significant where field lengths are short - as with the xBASE date, logical and numeric types - but it can be a real liability if there is a need to store significant amounts of character data. In addition, the width of an xBASE character field is normally restricted to around 250 characters, which is not really enough for purposes such as a comments field.

It was for these reasons that the original DBF format was extended to include a memo field and its accompanying, separate memo file. The xBASE memo field is not a field in the true sense, but a 10-character ASCII string which points to the location where the data is stored in the separate memo file. Unlike the DBF, the memo file does not reserve space for empty records, nor does it impose a limit on the quantity of data that can be stored.

The xBASE memo file has some real advantages but uses a block method of storing data which continues to cause problems to end-users and developers alike. These shortcomings have provided an incentive for a series of derivatives and variations. The result is that currently there are no less than six different xBASE memo file formats, with a seventh about to appear.

Once around the block

A memo file is created automatically by xBASE when a memo field is defined as part of a DBF's structure. Only one memo file is created irrespective of the number of memo fields in the DBF. Memo files have the same root name as the parent DBF plus an extension which can be either DBT, DBV, FPT or SMT.

Memo files with a DBT extension are one of the three different dBASE formats, one each for dBASE III/III+, dBASE IV and dBASE V. The first of these DBT formats was the pioneer and set the basic pattern from which all the others, except DBV, are derived. Clipper is the only mainstream xBASE product which continues to feature the dBASE III/III+ DBT memo file format as standard.

The method of storage adopted in the DBT format is based on blocks of 512 bytes. The whole of the first block is reserved as the file header but only the first 4 bytes are used, to store the number of the next block. As new data is added it is always stored from the beginning of a block. If the data exceeds 512 bytes additional blocks are allocated as necessary and the value in the header is incremented.

The relatively large block size means that this can be an inefficient method of storage if most memo data is less than 512 bytes. It does however add variable length fields to what is otherwise a fixed-field-length storage medium. The big problem with this form of DBT is how it handles edited data, which instead of being stored back to its original location is treated as new data and stored in the first available unused block or blocks. The old blocks are not cleared of data or released for re-use but remain taking up space in the memo file. This accounts for the well-known phenomenon of xBASE memo file bloat. A constantly edited memo file can balloon in size dramatically, to the point where it can fill a moderately-sized hard disk.

For this reason the original DBT type memo file requires constant maintenance, preferably through use of the xBASE `COPY` command which copies both the DBF and memo file but discards any unreferenced blocks in the DBT. Current versions of Clipper include an external utility - DBT50.EXE - which does the same job.

The problem of bloat is compounded by the large fixed block size. Despite this, the first version of the DBT format continues to be used as the common denominator of xBASE memo files, as it can be read and written to by all the major variants of the language.

The memo file, attempt two

A second attempt at the memo file was made with the release of dBASE IV. The dBASE IV memo file, which confusingly also has a DBT extension, features several innovations but represents a fumbled attempt to solve some of

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the problems evident from the first DBT.

For example, the block size is variable and can be set or reset from within xBASE with the `SET BLOCKSIZE TO` command. Although a blocksize of 1 to 63 can be set, this is in increments of 512 bytes, so that a blocksize of 2 means blocks are 1KB in size. The ability to vary the block size is catered for by a modification to the file header, which stores the block size in bytes 6 and 7.

xBASE memo file bloat is a well known phenomenon - a constantly edited memo file can balloon in size dramatically, to the point where it can fill a hard disk

As with the original DBT, only character data can be stored, but there is a small change in the method of storage. Each group of blocks or memo group has an 8-byte header, which in this implementation is used only to store the length of the data in the group.

This second version of the DBT does have one important improvement and that relates to edited data. Provided that the length of edited data does not exceed the capacity of the blocks currently allocated for it, it is stored back in its original location. This reduces the problem of bloat but does not entirely eliminate it.

This new DBT memo file format, unlike the original, did not become an xBASE standard. It had sufficient differences to be incompatible with the first DBT and too few advantages over it to gain acceptance amongst developers. For this reason, Clipper (as already noted) continues to use the original DBT, but Fox features a descendant of the dBASE IV memo format. It was the Fox format which not only became the industry standard but transformed the use of the xBASE memo file and brought it into the 90s.

FoxPro shows the way

The FoxPro memo file format, the FPT, features all the dBASE IV innovations such as variable block sizes and the memo group header. The variable block size feature is used to far better effect than in dBASE IV. The default block size is set lower, at 64 bytes, but can be set as low as 33 bytes if required. The most important feature of the FPT is that it was the first xBASE memo file format to allow binary data to be stored as well as text. This is accommodated with only a small change to the memo group header. The first four bytes of the header contain a value of either 0 to indicate that binary data is stored or 1 to indicate text data.

When the FPT was first implemented in DOS FoxPro, binary data storage was of limited value. But it did, for example, allow all the support files for an application to be stored in a single DBF/FPT combination. Where the FPT's facility to store binary data has become particularly useful is under Windows, where a variation on the memo field, the General field, allows OLE objects to be embedded.

The present Fox FPT is now being superseded by the Visual FoxPro version of it, which also has extension FPT. The new FPT works differently: for example, the pointers in the DBF are 4-byte integers instead of 10 ASCII bytes. None of the current 2.6x releases of FoxPro support this format, although this is about to be fixed with the 2.7 upgrade. Other xBASE platforms and utilities will similarly need to be upgraded.

The binary storage feature of the FPT has been adopted by dBASE V in its current DOS and Windows versions, producing a third memo file variation with a DBT extension. SuccessWare have also introduced a variation of the Fox FPT memo file, the SMT, originally as part of the Clipper SIx Replaceable Database Driver (RDD). The SMT memo file will not be familiar to many xBASE developers but is becoming better known because it is a feature of SuccessWare's Rocket product. Rocket is a Windows xBASE database engine which can be utilised by any language which uses VBX controls or can call a DLL such as C, C++, PowerBuilder or Visual Basic. A special version, 'Apollo', can be used as a replacement for the Borland Database Engine in Delphi. Like the SIx driver, the Rocket engine supports the dBASE III/III+ type DBT and the FoxPro FPT as well as the SMT format.

For all its advantages, the FPT only *alleviates* the problem of bloat. It does not eliminate it as the presence of the FoxPro command `PACK MEMO` confirms.

Memo file alternatives

The only alternative to the xBASE memo file not to use a version of the block storage method is FlexFile, a Clipper third-party RDD. The FlexFile memo file - the DBV - features a genuine variable-length field. Unlike the SuccessWare product, FlexFile has not been developed into a more general purpose form and for this reason remains relatively obscure. However, a version of it is bundled with the newly released Clipper 5.3, so it may become better known.

Another alternative to the memo file is a third-party product called Word Wrapper from Strategic Edge (CompuServe 74660,1422). Rather than improving on the memo format, Word Wrapper eliminates it. The product is supplied as source code in a variety of xBASE formats including Clipper, dBASE and FoxPro.

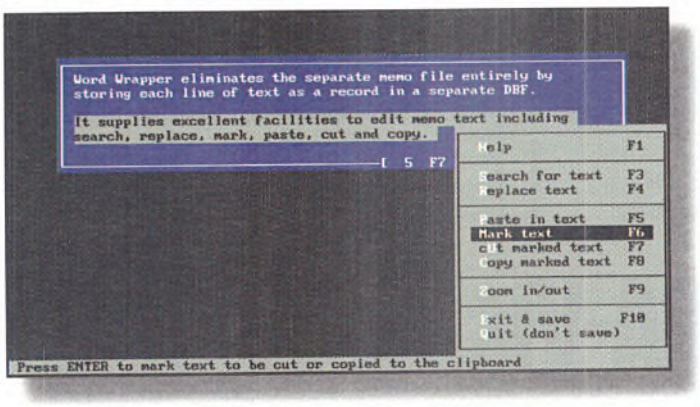

Figure 1 - Word Wrapper, seen here in its Clipper version, is a memo file replacement

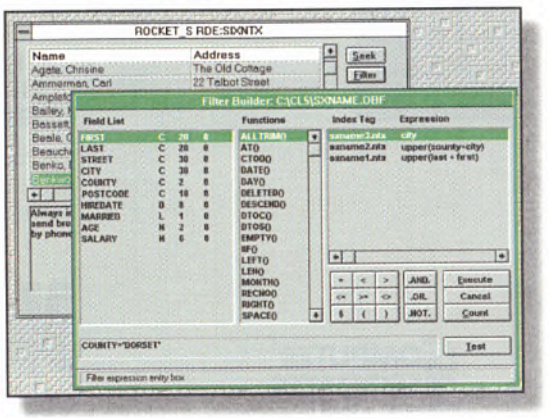

Figure 2 - SuccessWare's Rocket xBASE database engine in action

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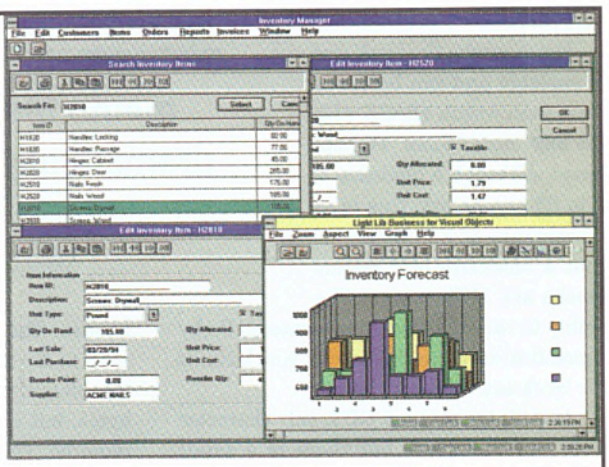
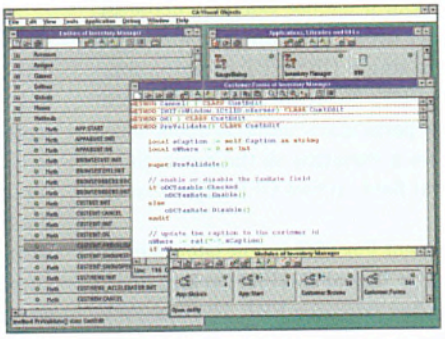
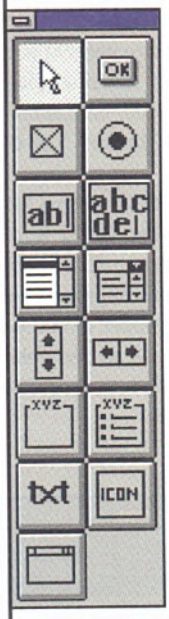


Developers: Bet You Haven't Seen Xbase Like This Before.



It's easy to create Windows applications with browsers and editors that design and manage the process.



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Word Wrapper provides a complete text editing facility, including copy, cut and paste, but stores each line of data in an ordinary, separate DBF file. This DBF consists of two fields, one of 65 character length for the text and a second which has a unique ID for indexing purposes. It is a simple idea but quite complex to implement fully, as the extremely well-commented and substantial source, around 265 KB for the Clipper 5.x version, demonstrates.

A utility to convert existing DBT or FPT memo files containing text data to Word Wrapper format is included. There is also an optional Toolbox which adds additional features such as spell checking and text file import.

Word Wrapper brings a quite heavy memory overhead to an application, around 60 KB for Clipper, but is a fully developed and mature alternative to a memo file. Provided that only text data is involved it is worth consideration.

Are you there?

One of the potential problems with storing memo data in standalone files is that they can easily be separated from the parent DBF. This is most likely when the DOS copy command is used to move files from one directory to another. An attempt to open a DBF will trigger an error message if a memo file is missing. Checking whether a DBF has an associated memo file is simple - use a hex editor to check the value of the first byte in the file header. If no memo file is referred to, this value will be 3 for Clipper, dBASE III/IV and V, FoxPro and SuccessWare's SIx driver or Rocket. When a memo file should be present, the (hex) value will be 83 for Clipper and dBASE III DBT, 8B for dBASE IV or V DBT, F5 for FoxPro FPT and E5 for SuccessWare SMT.

The dBASE IV DBT remains a niche format, and has been superseded the newer dBASE V DBT which is even *more* of a niche format

The new Visual Fox DBF does not follow this pattern: the first byte has a hex value of 30 regardless.

Accessing memo files

Clipper, by use of the RDDs supplied with it and/or appropriate third-party products, can read and write to five of the existing six xBASE memo file formats. It cannot currently handle the latest dBASE V memo file type or the new Visual FoxPro type.

Neither dBASE or FoxPro can handle the DBV or SMT memo file types. Both can handle either of the DBT formats and the current FPT format. FoxPro cannot access newer dBASE V DBT memo files.

Outside of using xBASE products the two most supported formats are the original DBT and the current FoxPro FPT. The success of the FPT format has been reinforced by FoxPro's status as a Microsoft product, resulting in, for example, ODBC support in products such as Word for Windows. The dBASE IV DBT remains a niche format, and has been superseded the newer dBASE V DBT. This features binary storage like the FPT but is even *more* of a niche format than the previous dBASE IV version. The current dBASE V range will work directly with the FoxPro FPT so Borland could have standardised on this rather than introducing yet another variation.

Of the two specialist varieties of memo file associated with Clipper, the DBV is not accessible outside of Clipper and the FlexFile RDD in terms of reading and writing data. This is not the case with the SMT format because of SuccessWare's Rocket, which will be the first choice for many developers for accessing xBASE data because of its many additional performance-related features and the quality of its documentation.

If the need is to access data for reporting purposes only, then the most versatile products for accessing xBASE memo files are the two R&R version 6 report writers, xBASE edition for DOS and xBASE edition for Windows. Both feature native file access and can access the DBV and SMT memo file formats. Neither will access dBASE V memos or the Visual Fox format, but can be expected to be upgraded to do so. Of the two, the Windows version is likely to be favoured because it offers a higher quality of reporting including graphics. R&R reports can be distributed royalty-free with the supplied runtime module. R&R Software has a UK office and can be contacted on 01628 788181.

Memo problems

Judging from the number of repair and recovery utilities available, xBASE DBF and memo files continue to suffer from a significant incidence of problems such as corrupted or missing data. Factors such as highly fragmented hard disks do not help and regular use of `DEFRAG` or similar is a useful preventive measure.

Memo data is particularly vulnerable because of the absolute reliance on the pointer in the DBF as the only link to the memo file. There is no corresponding 'back-pointer' in the memo file, so if for any reason the DBF pointers become corrupted then the data is lost. The normal methods of protecting data, such as regular back-ups, are not the whole answer because memo file corruption is not always immediately obvious if

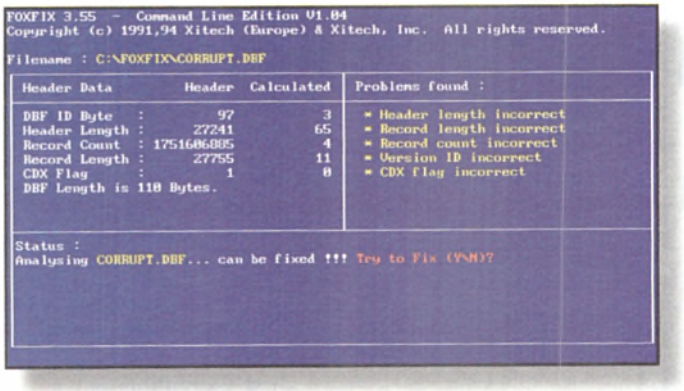

Figure 3 - FoxFix is a general purpose FoxPro repair and recovery utility

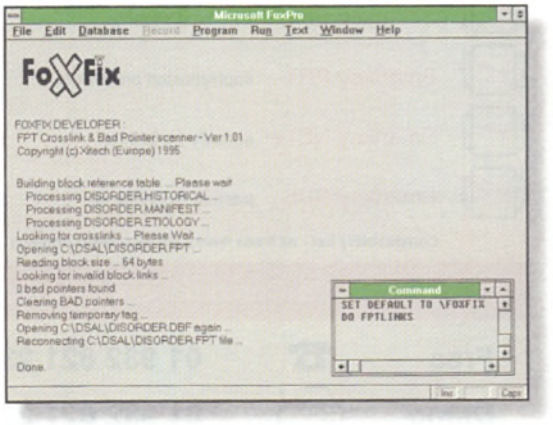

Figure 4 - FPTLinks will repair memo file damage

only a small proportion of records is involved. Often only when corruption becomes severe will xBASE generate an error message.

The dilemma for the developer at this stage is that the corruption needs to be corrected to allow the application to run, but correcting the problem and recovering the data as well is not always possible. Resorting to a specialist xBASE recovery/repair utility is generally the best option. One of the better known is Paul Heiser's dSalvage, which includes a facility to edit the DBF pointers directly. This works well if only relatively minor corruption exists, such as several pointers pointing to the same block of data. Correcting this is possible where the associations between blocks of data and the DBF records are easily established and where a fairly small number of records is involved. Where this is not the case, a more automated form of recovery is preferable if not essential.

A possible choice for FoxPro developers is FoxFix from UK-based XiTech. FoxFix is a collection of recovery utilities including FPTLINKS, which will remove cross-linked and other bad memo pointers. The really interesting feature of FoxFix is that it provides FoxPro DOS and Windows libraries which include a function allowing memo file damage to be detected and repaired while an application is running. This opens up the possibility of continuous preventative action as an alternative to the uncertainties of attempting to correct large scale corruption and recover data. XiTech can be contacted on 01707 276637.

The xBASE memo file is a curse and a blessing in almost equal measure

A more basic problem than corruption or loss of data is xBASE reporting that a memo file is missing. The method of identifying where a DBF has an associated memo file has already been covered, but as may have been observed, this also gives some clue as to which type of memo file is involved.

A missing dBASE III/III+ type DBT can be recovered by copying any other file or creating a file which has the root name of the DBF file plus a DBT extension. This method will not work with dBASE IV DBT, FoxPro FPT or the SuccessWare SMT. In these cases, the answer is to create an empty DBF with one memo file and rename or copy the memo file to match the missing file. Neither method is of any help in restoring data, but they do allow the DBF to be opened.

Conclusion

The xBASE memo file is a curse and a blessing in almost equal measure. It has come a long way from its roots as a way of storing text data, and through the medium of Visual FoxPro is continuing to evolve and develop. As is typical of xBASE, the price of evolution and development has been a plethora of different file types, with the inherent incompatibility problems.

Some xBASE vendors and xBASE third-party suppliers have eased the incompatibility problems but added more of their own. It is not all bad news - the intense competition between xBASE vendors and suppliers of third party tools has led to a series of innovations which have massively improved the performance of DBF-based applications. Examples are multiple index files and query optimisation. Together with the newer memo file features such as binary storage, this has ensured that the xBASE DBF, which might otherwise have been a fading standard, has not only survived but has thrived. ■

Colin Hume is a journalist specialising in software.

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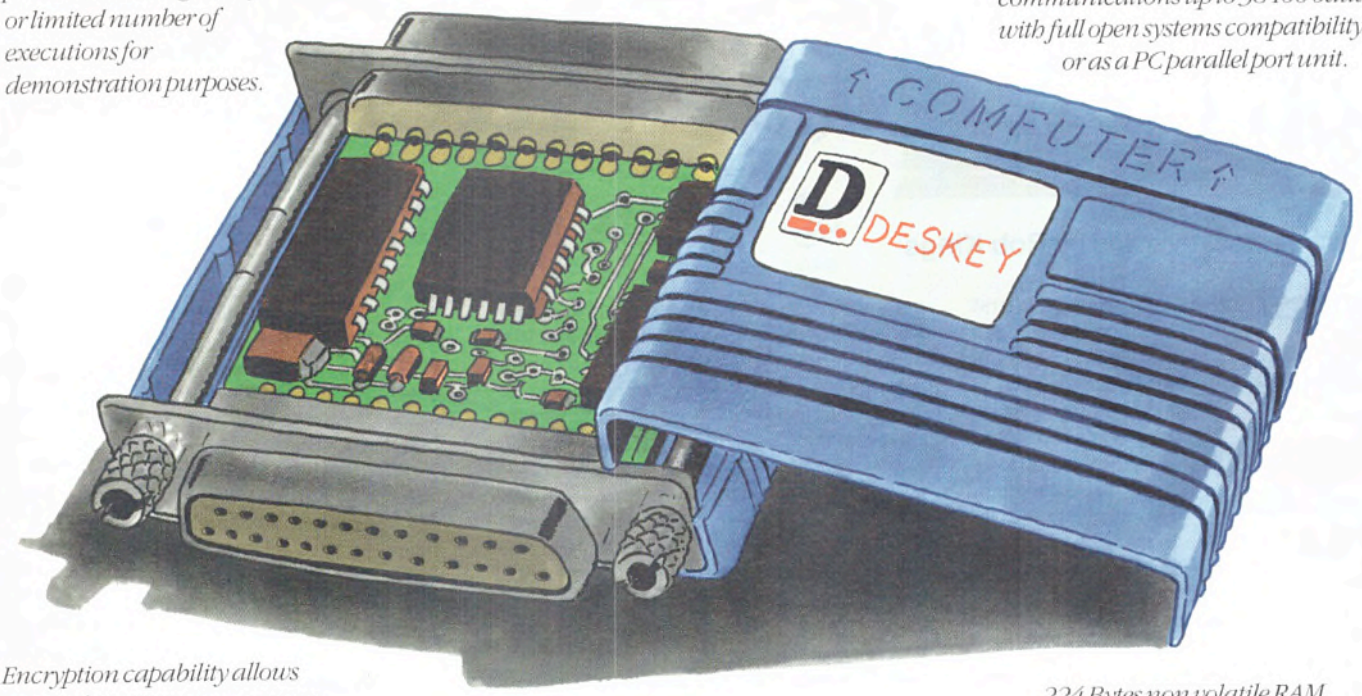

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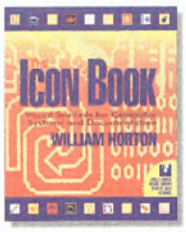
BOOKS (& Videos)

The Icon Book reviewed by **Rob Kings**



The title of my first book review sounded sufficiently dull to incur the derision of most of my colleagues. However, *The Icon Book* turned out to be an interesting read. Not only because of its practical nature, but also because Mr Horton's knowledge of his subject makes for some interesting analogies.

One tends to think of icon design as a twentieth century occupation. However, the opening chapter covers the history of the pictorial representation of ideas, all the way from Mayan hieroglyphs, via Quebecois road signs, to Windows, OS/2, and the Apple Mac.

The book is well researched with a large bibliography at the end of each chapter. It covers all areas of icon design. Dealing with aspects ranging from simple (how big they should be and what colour), through more complex (depth, motion, and juxtaposition), to the less obvious aspects (medical, social and cultural differences). Towards the end of the book there are several sections on just how to go about designing and testing icons, including some useful sample forms and a case study of one of the author's own projects.

Perhaps this book has come a little too late. In the opening paragraph of chapter two, the author states: *If you are a harried designer with a deadline approaching at sixty seconds a minute, you may be tempted to skip this chapter, feeling it is too theoretical to be of much immediate use.* I suspect that this is true, not only of chapter two, but also of the book as a whole. Take any application (for instance a word-processor) and the iconography is fairly consistent. Certainly in my own area of development, Windows programming, this is true. Microsoft has already dictated the terms. Icons should be grey, 3D images, lit from top-left, and the icons for popular functions, (Cut, Paste, and Save, etc) while bad, are *de facto* standards. It would be a confident developer who re-designed the *save* icon (though perhaps some iconoclast - sorry! - should, since who now uses the save icon to write to a floppy disk?)

Mr Horton covers in 400 pages what the *Microsoft Visual Design Guide* attempts to cover in about six. For my money Mr. Horton wins hands down. My only complaint is that the optional accompanying disk is a little disappointing. The icons are black and white, 2D images. If you are after a ready-written library then this isn't for you. However, if you want to start from basics, and produce a really nice user interface, then it could be.

I had intended to end this review with a thumbs up icon. then I read chapter 10 (Icons for International Products) and learned that in Sicily, this gesture means something entirely different. So instead a cri de coeur.

✔ **Verdict: Recommended for Designers/Developers**

Title:	*The Icon Book - Visual symbols for computer systems and documentation*
Author:	*William Horton*
Publisher:	*John Wiley*
ISBN:	*0-471-59900-X*
Price:	*£24.95 (icon disk extra)*
Pages:	*417*

Borland Delphi Software Learning Video reviewed by **Will Watts**

First, a double declaration of interest. Not only does the outfit for which I work occasionally flog copies of the video in question, but I confess to have been drinking with its star. I believe what follows is dispassionate, but now you have the facts you can turn up the gain on your cynicism as appropriate.

Borland Delphi, published by the British company SofTVision as part of its Software Learning Video! series (the shriek-stop is theirs), is a three hour tape intended to give neophyte Delphi programmers a leg-up. It is presented as a two-hander between SofTVision's Stephen Berry and Borland's Guy Martin - yes, he of several thousand C++ demonstrations, and my co-imbiber - sitting side by side before a camera in the CNN standard slightly-too-close for comfort position, Mr Berry playing the part of the know-nothing newcomer while Guy dispenses Delphi pearls.

The video works on many levels. If you enjoy watching people grafting for their money, there is plenty for you here. As well as framing suitably dumb 'What do we do next, Guy?' questions, close observation reveals that Mr Berry is also operating the camera, flicking between the shot of himself and Guy and the PC screen, and operating a gizmo which magnifies a selected quarter of the PC screen up to full frame, so that the high-resolution Super VGA text may be visible on a low-resolution PAL telly. Meanwhile Guy is operating the Delphi demo, explaining the intricacies of the VCL and, I suspect, pedalling like mad under the desk to drive the generator for the studio lights. This makes the video sound amateurish and unslick, which is not fair because it isn't these things - it has a 'good home-made jam' feel to it.

Then there is Guy's presentation itself. With his habit of looking askance into the camera lens, and his knowledgeable and boyish enthusiasm for the product, Guy comes over as a sort of software Richie Benaud. Whenever a question comes up about something Delphi can't quite deal with, Guy says 'Certainly!' ('Does Delphi handle OLE 2?' 'Certainly, although you need a third party product to do OLE automation.') When the question targets one of Delphi's strong points, he says 'Absolutely!' ('Does Delphi include ODBC support?' 'Absolutely!') Guy says 'Absolutely!' a lot.

From a journalistic point of view the tape is interesting because Guy answers a few points which I have been unable to nail him on. On the thorny topic of whether it is 'Dell-fee' or 'Dell-fye', for example, I now have him on tape saying 'Dell-fee is the correct pronunciation.' (From context I think he meant to say 'British' rather than 'correct', but what the hell? the words are virtually synonyms.) More seriously, he states that Delphi is aimed at C++ programmers, among others, something I have hitherto failed to get a Borland person to admit.

The plot: in 14 segments, Guy introduces and implements on screen a little application called News Net which manages to combine text editing, database handling, multimedia, button bars and pretty well every other gizmo in the Delphi repertoire. The tape doesn't really go into any depth, but that's OK, because complex programming techniques don't lend themselves to video tutelage very well. Lock a Delphi virgin in the conference room with this tape and at lunch time he will emerge, blinking in the sunlight, capable of knocking out simple Delphi apps and eager to do so.

Criticisms: I would have liked paper documentation and/or a disk with the tape, so one could refer to the material without having to scurry to a television. SofTVision could usefully experiment with the colour settings of its Windows set up: the white-out-of-blue combination of an active title bar blurs like one of Michael Fish's 1970s jackets. And I think that, at £99, the video is a tad expensive for what it is.

But all in all: good clean fun, a trillion times more watchable than US offerings of this type, and informative with it.

✔ **Verdict: Fab? Ab!**

Title:	*Borland Delphi*
Publisher:	*SofTVision is on 01703 701470*
ISBN:	*0-471-59900-X*
Price:	*£99*
Length:	*Three hours*

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Terry Pratchett's Discworld: The official Strategy Guide

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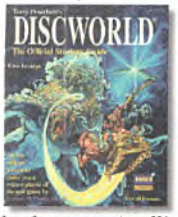

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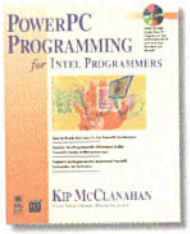

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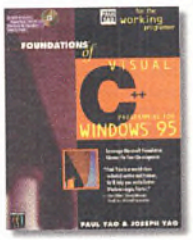

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Find everything you need to master the Microsoft Development Foundation Library and build better Visual C++ programs. this book takes you through all the various levels of Windows programming (C++, DSK, MFC) in a way that ensures a confident and competent approach to coding. It focuses strongly on the critical connections between the native Windows WIN32 API and key classes provided by MFC. Bonus CD-ROM features a hypertext version of the book and valuable source code.

Selection	*RRP*	*Your Price*
Windows 95 Secrets	£38.99	£29.25
Power PC Programming for Intel Programmer	£48.99	£36.75
Foundations of Visual C++ Progr for Windows 95	£38.99	£29.95

Descriptions of all books below can be found in EXE Magazine, issues from February to September.

Selection	*RRP*	*Your Price*
201 Principles of Software Development	£20.95	£16.80
Oracle: The Complete Reference, Third Edition	£25.95	£20.80
Teach Yourself Delphi in 21 Days	£23.00	£17.25
Delphi Unleashed	£35.50	£26.65
Visual FoxPro Developer's Guide	£41.67	£31.25
Heavy Metal Visual C++ Programming	£37.99	£28.50
Delphi Programming for Dummies	£18.99	£14.25
5 OLE Wizardry	£28.95	£23.30
C: The Complete Reference	£25.95	£20.80
The Visual C++ Handbook	£25.95	£20.80
Guide to the Best UNIX Tips Ever	£23.95	£19.20
Object-Oriented Graphics Programming in C++	£29.95	£22.50

Selection	*RRP*	*Your Price*
Video Compression for Multimedia	£29.95	£22.50
The Fuzzy Systems Handbook	£34.95	£26.25
Leaping from BASIC to C++	£27.00	£20.25
The GUI Style Guide	£29.95	£22.50
Agents Unleashed	£29.95	£22.50
Database Developer's Guide with Visual Basic 3	£41.67	£31.25
Object Oriented Programming in C++	£27.50	£20.65
Win 32 API - Desktop Reference	£46.30	£34.75
Developing PowerBuilder 4 Applications	£35.50	£26.65
Heavy Metal OLE2 Programming	£38.99	£31.20
Unauthorised Windows 95 Developers Resource Kit	£38.99	£31.20
Free $tuff from the Internet	£18.99	£15.20
Oracle Performance Tuning	£25.95	£19.50
TCP/IP Network Administration	£22.00	£16.50
sendmail	£24.50	£18.40
UNIX in a Nutshell	£ 7.50	£ 5.60

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Please allow 28 days for delivery.

WINDOWS NT / MSWINDOWS / VISUAL C++

GLOBAL SOLUTIONS
Reading **to £32,000**

Our client is a prestigious provider of tailor made global messaging solutions and services. They are seeking software engineers at all levels with communications skills, (X25, X400, ISDN etc) to join various teams from junior through to senior levels working on new Windows 95 solutions. A knowledge of MSWindows and VISUAL C++ is essential.

Ref: JJ/EA2

C++, MFC MOVE TO NT OR '95
South Herts **£20,000 - £24,000**

With the launch of the latest of their leading asset management product, our client is poised for further growth and success. Using the very latest WINDOWS based software they require Software Engineers with a minimum of one year and up to four years development experience, with technical skills including Visual or Borland C++, OWL or MFC application framework, good analytical skills and the ability to produce high quality code.

Ref: PH/EA1

VISUAL C++
Woking **£18,000 to £30,000**

One of the world's leaders in developing innovative MSWindows software products is currently looking for three further Software Engineers to join their "New Projects Team". they require prospective candidates to have a minimum of one years Visual C++ MFC experience on either MSWindows or Windows NT. Any additional exposure to Object Oriented Design methods would be advantageous.

Ref: DL/EA2

ADVANCED COMMUNICATION
Henley-on-Thames **£20,000 - £28,000**

This extremely successful global messaging solutions provider, who are experiencing rapid growth, are now looking for additional consultants/developers to keep them ahead of the competition. You will need strong skills in UNIX, 'C', Shell Script writing with a knowledge or interest in Email and communications including some of the following areas: TCP/IP, X.400, X.25 Networks, Novell, OS/2, windows NT.

Ref: JJ/EA3

CREATIVE C++ DEVELOPERS
Cambridge **£17,000 - £27,000**

This high profile company are seeking software engineers at all levels to work on creative, large scale CD-ROM/Multimedia projects encompassing both WINDOWS and MAC technologies. A minimum of one year's C++ programming is required for the junior positions with an interest in WINDOWS. For the more senior posts you will have two plus years of 'C'/C++ along with MFC, SDK and a good degree. Exciting moves into NT, Mac and on-line Internet systems development is already planned. **Ref: PH/EA2**

CONSULTANT-WINDOWS C++ DEVELOPER
Berkshire **£30,000 - £40,000 package**

Here is an opportunity for a senior Windows developer to work at the leading edge of Communications and Email solutions. Suitable applicants should have a range of Windows skills including Visual C++, MSWindows (MFC), WindowsNT including DDE and Windows 95. This high profile role, as well as development, offers high level consultancy and the opportunity to travel throughout Europe and the USA.

Ref: PH/EA3

OLE
Cambridgeshire **Up to £30,000 + benefits**

My client require an experienced object developer with solid experience in C++ with MSWindows and excellent OLE skills to join a team working on new projects. The position will be based at the prestigious UK headquarters in rural Cambridgeshire with the potential of travel to other worldwide offices. the company offer an excellent technical environment with the latest tools and compilers coupled with a relaxed and informal atmosphere. **Ref: TJ/EA3**

MSWINDOWS COMMUNICATIONS
South Croydon **£ Neg**

Due to recent expansion this telephony communications company are now looking to recruit a number of MSWindows engineers to work on new complete client solutions in Windows NT and Windows 95. The successful applicant will have some telephony or communications skills and a keen desire to work in a dynamic environment. A knowledge of MSWindows is essential with skills in some of the following: VISUAL C++, VISUAL BASIC, 'C'. **Ref: HH/EA1**

32-BIT MULTIMEDIA DEVELOPMENT
Maidenhead **£15,000 to £27,000**

This software house producing state of the art graphics and video based multimedia systems for Windows are currently looking for additional engineers. To be considered you will need to be degree educated and have a minimum of one years commercial experience in C++, ideally Visual C++ with MFC, for new projects work that are being developed on Windows NT and Windows. They are also looking for NEW GRADUATES with Visual C++ experience on MSWindows or Windows NT. **Ref: DL/EA1**

VISION COMPUTER RECRUITMENT

These are a small selection of our current vacancies. Please call or send/fax a CV for more information.

VISION Computer Recruitment, 70A High Street, Stony Stratford, Milton Keynes MK11 1AH.

Telephone: 01908 260910 Fax: 01908 260098

VISION

EXPERIENCED SOFTWARE DEVELOPERS

Cambridge

Jobstream Group Plc is a financial and professional services software house, serving clients throughout Europe, the Caribbean and emerging financial centres. Our products are the most flexible and powerful software tools available for integrated portfolio administration, client accounting and practice management.

Success in our target markets means that the Group is going through a period of rapid growth and we are expanding our programming team. We wish to recruit experienced software developers to participate in developing the latest generation of our JOBSTREAM range of software for the Microsoft Windows platform.

You would be working as part of a highly-qualified and experienced team, within which you would be encouraged to make the greatest possible use of your technical ability and to take individual responsibility for particular projects. As a graduate with strong development skills and 4-8 years of experience, you will have CA Clipper programming experience and be keen to develop a high level of proficiency using CA Visual Objects.

Jobstream Group has an ongoing policy of providing specialist training for its staff and you will be given access to courses that enable you to extend your skill base. The salary and benefits package offered will be directly related to your track record and ability.

If you have identified yourself as one of the software developers we are looking for, then please apply in writing, enclosing a comprehensive C.V. to:- The Personnel Officer, Jobstream Group Plc, PO Box 30, St John's Innovation Centre, Cowley Road, Cambridge, CB4 4AJ.

JOBSTREAM®

C++/VISUAL C++

Surrey

£18,000 to £35,000

Our client, a specialist software development company, with a current annual turnover in excess of £10m, are seeking to identify several new development professionals to complement their drive to establish their position as one of the world's leading suppliers of high tech, innovative medical systems.

Opportunities exist for Graduate Programmers who can demonstrate at least 12 months' commercial C++/Visual C++ development experience, through to seasoned Systems Engineers and Team Leaders with recent C++/Visual C++ under Unix, Windows or Windows NT.

These are excellent career opportunities with a progressive company, offering 'State of the Art' technical challenges, in addition to an excellent working environment and benefits package.

To apply, forward your CV to Robin Phillips at The Windows Connection, The Elms, 26 Broad Street, Wokingham, Berkshire RG40 1AB.

Tel: 01734 892444. Fax: 01734 893322.

Email: mail@winjobs.win-uk.net.

The Windows™ CONNECTION

IMMERSIVE VIRTUAL REALITY TECHNOLOGY

C/C++ WINDOWS SOFTWARE ENGINEERS
Leicester – £ Excellent

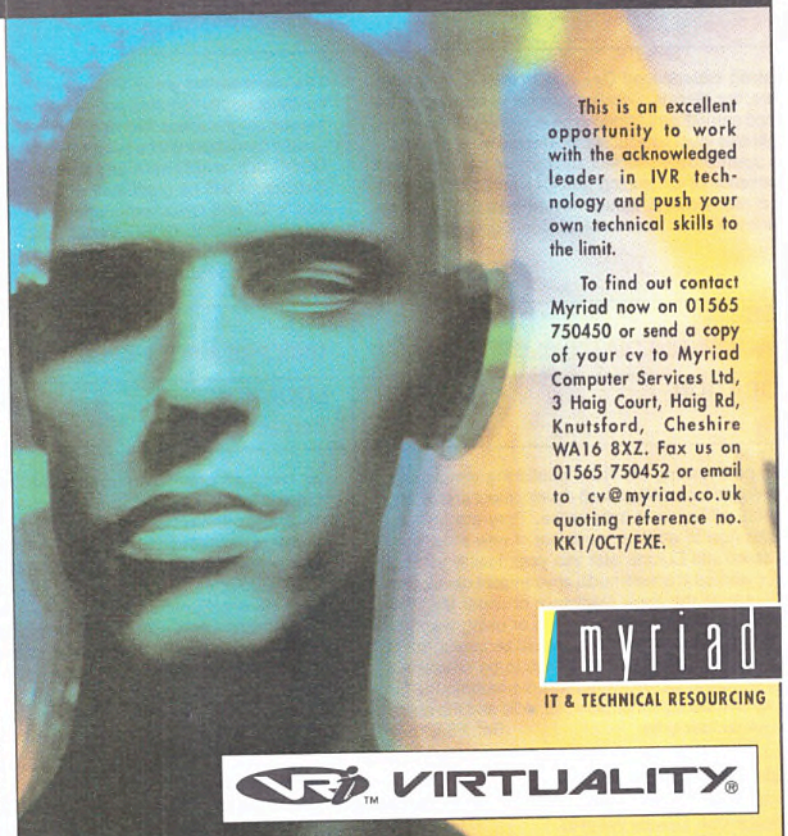
Virtuality Group plc, a rapidly growing global company with offices in the UK, USA and Japan, is dedicated to the development of Immersive Virtual Reality (IVR) technologies and products. With over 1000 machines installed in over 35 countries worldwide, Virtuality provides the de-facto standard for IVR technology. A growing number of companies including IBM, Sega and Atari use Virtuality products under licence for their own VR product environment.

The Technology Division's mission is to provide a Virtual Reality development environment and toolset to support the application development community and its licensees. V-PC provides a Realtime open Virtual Reality operating environment with a full suite of streamlined and feature-rich libraries to support today's advanced VR applications. V-SPACE is an interactive 3D modelling and VR world creation system running under Microsoft Windows. In addition this division is developing a number of new technologies and initiatives including Microsoft Games SDK, the Internet (VRML) and Artificial Intelligence.

This division now has a number of opportunities for highly skilled Software Engineers to work in a leading edge environment, developing interfaces to the latest accelerated VR hardware. You will need an excellent understanding of a selection of the following:

- **C & C++**
- **Realtime software techniques**
- **DOS/Windows 95**
- **Hardware Interfaces**
- **Low level coding and Assembler**

In addition, experience in PC operating systems and infrastructure (encompassing Realtime 3D Graphics) and Multi Media knowledge would be advantageous. It is likely that the successful applicant will have knowledge of on line services such as Compuserve, the Internet and Microsoft Developers Network.



This is an excellent opportunity to work with the acknowledged leader in IVR technology and push your own technical skills to the limit.

To find out contact Myriad now on 01565 750450 or send a copy of your cv to Myriad Computer Services Ltd, 3 Haig Court, Haig Rd, Knutsford, Cheshire WA16 8XZ. Fax us on 01565 750452 or email to cv@myriad.co.uk quoting reference no. KK1/OCT/EXE.

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Surrey
Tools Engineering
to £25k

US Software vendor, this small but dynamic desktop products manufacturer are serious about 'LOCALISATION', and actively seeking Tools Engineers, to help develop translation kits and testing tools. You will have exposure to Visual Basic and/or C++, be available for international travel, a team player, foreign language skills are a bonus. RC06

Berkshire
Visual C++
£18k - £30k

Small, dynamic systems vendor, require programmers from Graduate to Systems Engineer level who can demonstrate solid OOD techniques. You will have good Visual C++ skills, however, C++ and MFC will be considered, you must thrive in a 100% development environment and be able to handle autonomy. MU04

London
Access, VBA
£23k

Independent software house, require two Desktop Systems Integrators to develop bespoke GUI's for an existing EIS product. You will demonstrate good Access, Excel and VBA skills, additional Delphi training will be given. RM02

Middx
C/C++
£20k - £30k

Established plc, this software house has recently re-launched its entire portfolio across both the Windows and Windows NT platform. Several Developers through to Team Leaders are required to embark upon a second phase, to include Windows 95, you will have from 1-5 years C/C++ experience with both DOS and Windows expertise. UL05

Docklands
C++
£20k - £35k

International financial services company, require several C++ developers at all levels, regardless of operating system, to join a new projects team developing Core systems across a multi-platform environment. Excellent working conditions, free health club. RH03

London
Paradox
£24k

Established systems integrator require a Paradox expert to join their bespoke software development team. You will have 2 years' P.A.L. experience and latterly Paradox for Windows. Training in Access, Delphi and Oracle is available. UM01

The Windows™ CONNECTION

To apply, forward your CV to Robin Phillips at The Windows Connection, The Elms, 26 Broad Street, Wokingham, Berkshire RG40 1AB. Tel: 01734 892444. Fax: 01734 893322. Email: mail@winjobs.win-uk.net.

JOB C++ & UNIX/XWINDOWS

LOCATION M25 area **SALARY** £20K - £30K

Seeking experienced C++ and UNIX software engineers, our client is a leading supplier of software to the oil and gas industry. Working on one of several projects, applicants must be educated to degree level, preferably in a science based subject and have at least two years experience of developing with C++ under UNIX. Additional requirements, though not essential, include experience of X-Windows and Motif widget development.

Ref: JK/EXE/1

JOB CLIENT-SERVER

LOCATION Berks **SALARY** £20K-£24K

The client-server group of this leading UK software house currently requires additional development and support programmers. Working in a team of ten, the successful candidates will be involved in the development of ODBC SQL middleware and server based products. Candidates will be graduates with a minimum of two year's 'C' and UNIX experience and, ideally, some knowledge of SQL, ODBC, Visual Basic, Windows 95 or NT. These are excellent opportunities to learn new technologies in a dynamic environment. Ref: LC/EXE/2

JOB VISUAL C++/MFC

LOCATION W London **SALARY** £22K-£30K

Are you a high-flyer interested in the airline industry? Our client is about to embark on a major new project and requires a skilled Windows developer. For this technically challenging project, candidates should have strong Visual C++/MFC experience and, ideally, some familiarity with Visual Basic and/or OLE. Working in a small team, the successful candidate will be responsible for design as well as development. There will also be the opportunity for some international travel.

JOB MAC MULTIMEDIA DEVELOPERS

LOCATION City **SALARY** To £30K

Europe's leading CD-ROM publishing company is seeking to recruit Macintosh 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 on the Apple Macintosh or under MS Windows. Any experience of writing or using graphics software, sound or animation would be useful, but is not essential. There are openings to be completely trained using CD-ROM/Multimedia techniques for those with the right interpersonal skills and the ability to pick up new skills. Ref: FS/EXE/4

JOB UNIX PRE & POST SALES SUPPORT

LOCATION Berks/Surrey **SALARY** £27K-£40K + car

Our client, an established and successful Software House in the USA has set up its European HQ in the M4 corridor and is now searching for experienced support personnel and consultants. The systems are client-server in architecture, based on UNIX servers with MS Windows, Macintosh and UNIX Motif clients. There are opportunities for both pre and post sales skills. Strong UNIX with relational database/SQL skills are required. Any 'C' or Visual Basic programming skills would be an added bonus.

Ref: DE/EXE/5

JOB C/C++/TELECOMMS

LOCATION Cambs **SALARY** £18K-£30K

Our client is searching for highly professional and committed Software Engineers with a minimum of one years experience of writing 'C' code under MS Windows or UNIX. Any experience of C++ and OOD would be advantageous. The ideal candidates will have experience of working in a large, well structured development environment. There are also opportunities for those Software Engineers with experience of real-time embedded software systems. However, the most important factors for all candidates are a sense of humour, team spirit and a strong commitment to the production of quality software.

Ref: DE/EXE/6

Logistix Recruitment Limited
Lamb House, Church Street
Chiswick Mall, London W4 2PD
Fax: 0181-742 3061
email: logistix@atlas.co.uk

We have a large number of PERMANENT and CONTRACT opportunities throughout the UK. Please call one of our consultants for further information or, alternatively, post/fax/email a CV to us and we will contact you at a convenient time.

Tel: 0181-742 3060

Logistix

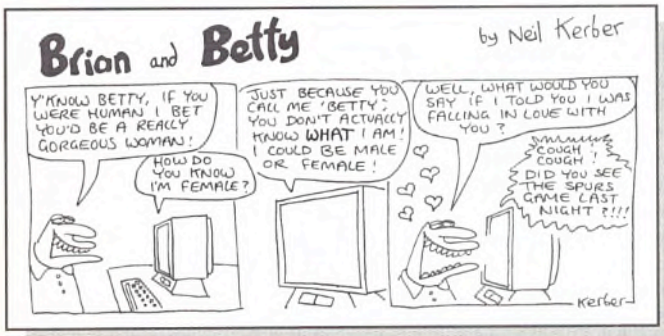
Ctrl Break

Please send your rants, raves and competition entries to:

Ctrl/Break
EXE Magazine
50 Poland Street
London W1V 4AX

Shameless Toady

Following on from last month's observation we can safely state that there is a large number of inhibition-free amphibians in the software world at present...



Download-a-spouse

BBS Magazine, for the benefit of those of you whose subscription has lapsed, describes in its August issue a 'board' with a difference. 'Russian Wives' (001 916 723 6832) provides a matchmaking service for 'lonely American men to Russian women eager to leave their homeland'. Log on and you get to see 25 GIF of JPEG images of young Russian women, each accompanied by a 'short, colourful description'. Drop 10 bucks and there is a selection of 500. If you fall in love with a bitmap, it's $150-$200 to get in touch with the original.

'A cynic', writes BBS Magazine, 'might take a jaded view. He might be a little put off by the meat market mentality [and] he might also question the motives of the women themselves.' Took the words right out of our mouth. Just to reinforce our contempt and disgust, Ctrl-Break called the number, strictly in the interests of journalism you understand, to discover 'Number temporarily out of service...'

Pass Notes

Yes. It's in The Guardian and the The Correspondent etc. etc.

Will Watts

Appearance: Aficionado of promotional software T-shirts circa 1970.

Function: Editor-At-Large of EXE magazine/The Geezer Who Keeps the Email Up To Scratch

Why this self-indulgent introduction of staff biographies to the editorial mix - are we soon to be reading of Doris the Cleaner as well? His Largeness, or Sir as he very kindly allows us to call him, handed over the honoured task of editing EXE full-time, after 7 years of association with the mag.

Tired of explaining 'how to use email' to the advertising team? More a case of his job being done actually - after a year or so's absence Sir Will was drafted in six months ago to give the old mag a bit of a revamp.

More pictures and groovy looking code boxes? Precisely. And now it's completed he's taking a back seat.

Nothing more to keep him fulfilled? No, we're not allowed to keep Doom on the network here.

But 'drafted' you say - how exactly do you force someone to work for a software development magazine? We found blackmail to be the easiest way.

Go on... EXE's Publisher, as a longstanding member of the team, happens to be the proud owner of a May 1990 issue of .EXE...

That's a tool for blackmail? ...this contains one of the first editorial masterpieces penned by His Largeness which states that:

"It's not that GUI hasn't really happened for PC-class machines; it is the feeling that it is never going to happen"

> And so comes the dismal realisation. It's not that GUI hasn't really happened for PC-class machines; it is the feeling that it is never going to happen; we are always going to have factions of users backing diverse systems, with the majority using text-based systems. ... window (seen about that) of one ... site for creating ... de facto PC standard ...

Ah ...but now that he's only writing for us on an occasional basis, the Publisher's slipped Ctrl Brk a fiver to inform the world.

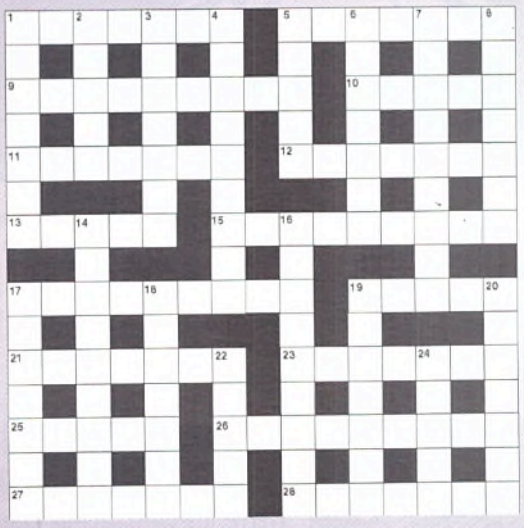
So you're very grateful that he's been working 24 hours a day and addicted himself to caffeine in the name of EXE then? Extremely. That's why we're trying to stop him finding gainful full-time employment anywhere else.

Not likely to say: Do let me give you a hand with that email system.

Even less likely to say: Hello Mr Employer take a look at this fine article I wrote in May 1990.

Most likely to say (now): Who needs a job when you can be King of Doom?

PRIZE CROSSWORD



ACROSS

1. Reserved in language search field and processor unit (7)
5. It gives 0 0 0 1 (3,4)
9. Input again for verification say (9)
10. Even in the background it disturbs the signal (5)
11. Former priest of pre-Christion church (2-5)
12. Go mad about read and write store and unit of stored data (7)
13. Makes slow progress with stages in the algorithm (5)
15. Being greedy with you French around, I follow gate and current (9)
17. Output wrongly as 0 due to shortage of space (9)
19. Apparently I'll find a row in church (5)
21. Well covered and ready for the cook (7)
23. Use such a storage location and you may be in trouble, sick and equal (7)
25. She's got a high interest account (5)
26. Quiet as a mouse doing without 10ac (9)
27. Dodgy politician across the Atlantic ... (7)
28. ... and where such people should end up between the columns (7)

DOWN

1. Cores of the operating software (7)
2. Give up results ... (5)
3. ... and these results are in IT (7)
4. Risk-taker? It's Dan with a far from angelic character (4-5)
5. Snake makes simple binary circuit (5)
6. Always ready for change, so go-getting! (7)
7. Disney's staff now joined by more and more computer users (9)
8. Teams with undecimal base (7)
14. How a back-up tape runs (9)
16. Laying down data on the disc once more (9)
17. Carriers of the latest news (7)
18. Begin again leisure pictures (7)
19. Sickness as men tail round (7)
20. Joins up the two-way linear structures (7)
22. Generous semiconductor impurity (5)
24. Silly but watchful birds? (5)

SOLUTION TO SEPTEMBER'S CROSSWORD

ACROSS: **1.** *THREAD* **4.** *SPOOLING* **9.** *RULERS* **10.** *TRANSMIT* **11.** *INTROS* **12.** *ENTRANCE* **14.** *APOSTROPHE* **18.** *AUTOMATION* **22.** *READ-HEAD* **23.** *BUCKET* **24.** *ELECTRIC* **25.** *MANTRA* **26.** *SCANNING* **27.** *DELETE*

DOWN: **1.** *TERMINAL* **2.** *RELATION* **3.** *AIRPORTS* **5.** *PARENTHOOD* **6.** *OWNERS* **7.** *IMMUNE* **8.** *GUTTER* **13.** *MODULATION* **15.** *TABULATE* **16.** *DISKETTE* **17.** *INITIATE* **19.** *BRIEFS* **20.** *CAMERA* **21.** *PHOTON*

Around & Around

'First Fire, then the Wheel, now Windows 95' - Microsoft advertisement in *The Times*.

Bilga struggled slowly up the hill, muttering curses into his beard at every step, making for the big cave just below the ridge. Every few paces he stopped to rest his burden, an unwieldy wooden frame structure held together with lengths of inexpertly tied weasel gut. By the time he reached the mouth of the cave he was completely whacked, and was obliged to stand panting in an undignified manner while a classy blonde - he could tell she was superior stuff, she had at least six teeth and almost no faeces in her hair - eyed him coolly over the mud daub work in which she had been engaged.

'Go right in Mr Bilga,' she snapped, 'Mr Olgmat is expecting you.'

Bilga shouldered his bundle and staggered into the smoky depths, where he found three fat men, squatting on their haunches by the fire, snacking on a pig's head which was sizzling on a hearth stone.

'Ah, Bliga,' cried the fattest of the three, getting up and offering a hand well-bespeckled with porcine cerebellum, 'glad you could make it.'

'The name's Bilga,' said Bilga, grasping the squelchy handshake.

'Bilga, Bilga, of course. How is the invention coming along? You know, I'm surprised at you being late - I'd have thought with your new *wheel* you'd be able to get here in short order.'

Olgmat's companions guffawed and dug each other in the ribs.

'The cart got stuck in the bog,' admitted Bilga, 'but I have brought along a beta for you to look at.' He indicated the frame at his feet.

'That's very kind of you,' said Olgmat, giving the wheel a contemptuous prod with his toe and causing one of the spokes to fall off, 'but I think it would be more pertinent to the marketing effort if you could just enumerate the benefits of this model over Wheel 3.11.'

'Well, it's got 32 spokes instead of just 16...'

'Spokes don't just grow on trees, you know,' said one of Olgmat's companions in a stage whisper, and the pair collapsed in fresh merriment.

'...and I have introduced new circular rim technology,' said Bilga, pressing on regardless, 'and of course the new design is much more robust than the old system.' By way of demonstrating this last point, he picked up the wheel and shook it. Another spoke tinkled to the ground.

'I suppose,' said the executive who hadn't spoken before, 'that all these extra doodads make the wheel heavier? That Mr and Mrs Grunt will have to buy a new, bigger cart in order to use it?'

'In most case, owners of modern cart technology will be able to bolt this on to existing hardware. It is possible that users of outdated carts will need to upgrade.'

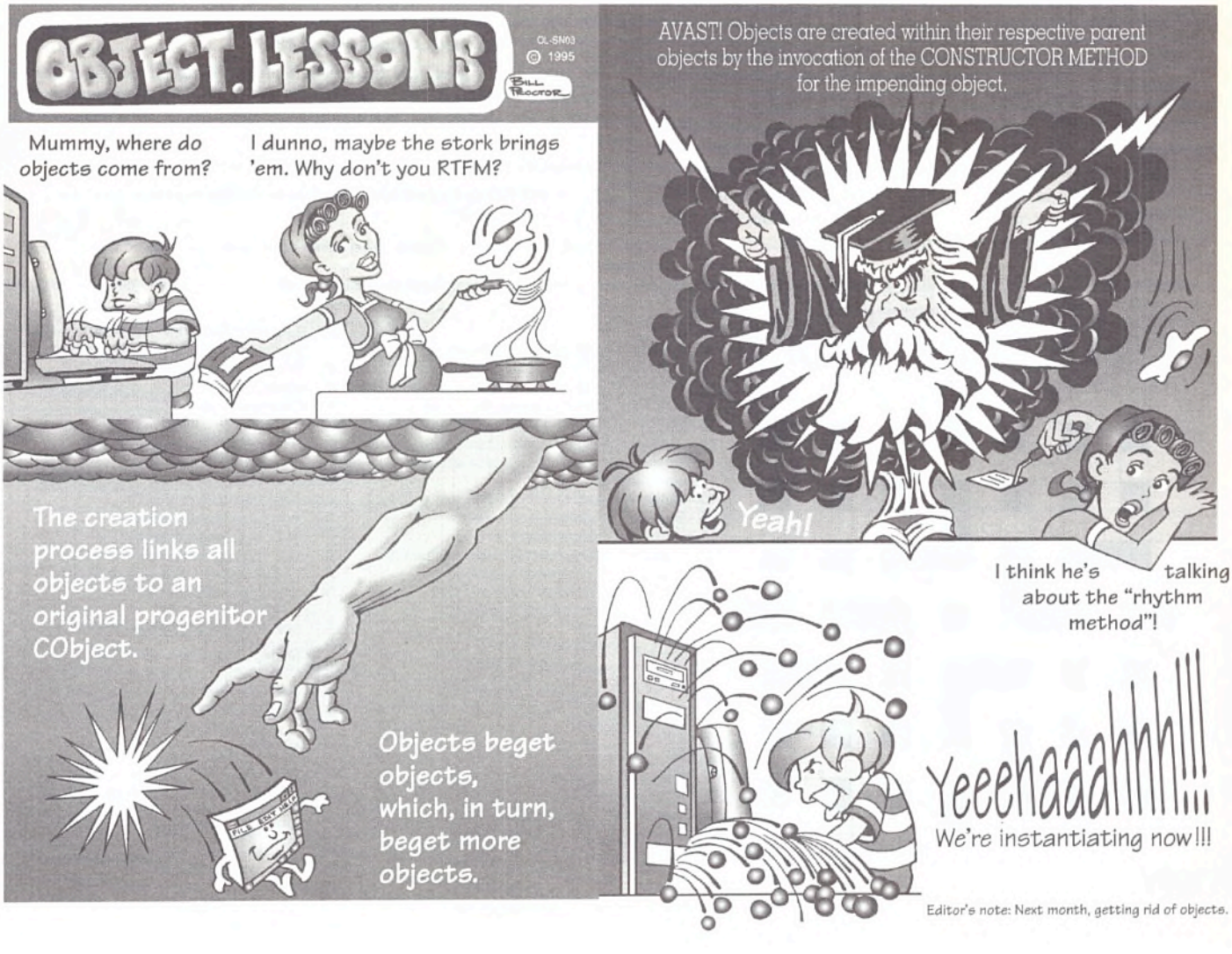
The executive rolled his eyes heavenwards. 'This is going to be the biggest dodo since that idiot fire guy came up with the idea of burning all your food before you eat it,' he muttered to his companion.

'What we need,' said Olgmat, who all this time had been tugging his beard and pacing up and down the cave, 'is a good tag line. Something not too technological - we don't want to frighten them. Something that expresses the freedom, the ability to travel, the world of possibilities that Wheel 95 will give your customers. Something that...' His voice trailed off in thought, his tiny brow furrowed in concentration.

'How about "Where do you want to go today?"' ventured Bilga timidly.

Olgmat's eyes bulged, and for a moment it seemed as though he was choking.

'Don't be ridiculous!' he snapped. ■



Editor's note: Next month, getting rid of objects.

Software Developers:

Software Piracy Burns Your Profits.

WORKSTATIONS: Sun, HP, IBM, DEC, SG **AMIGA**
NEC: DOS, Windows, NT, LANs
MAC: Macintosh, Power Mac, LANs
Xenix, AIX, AutoCAD, DOS Extenders, LANs

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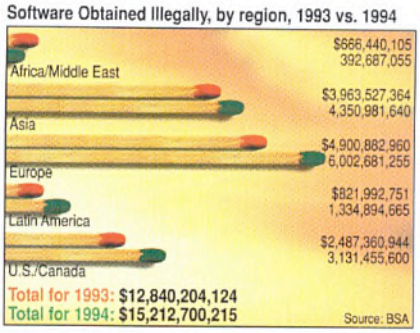
Each year, the illegal use of software consumes nearly 50% of your potential revenues. With the flames of piracy eating away at your profits, can you afford not to protect your software?

Software Obtained Illegally, by region, 1993 vs. 1994



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