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February 1995



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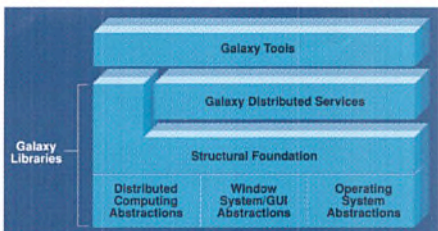
Career
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Page 85



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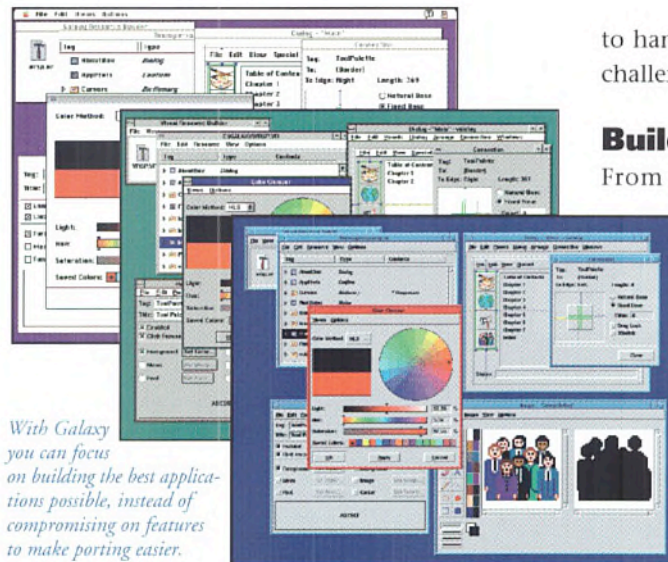
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Editorial.....3

If only developers would stop for a moment and consider whether they are really using the best tool for the job in hand. Is a 20 year old language still the best way to go?

News Review4

Could there be more FTC tremors for Microsoft? Plus special report on Philippe Kahn's resignation.

Product News8

Professional CAD for VB. Internet for NT.



THE FACE OF VISUAL PROGRAMMING

Treasures of Delphi14

Borland has been working on a rather special visual programming tool called Delphi. Has it really rewritten the rule book for RAD tools? Cliff Saran gives a guided tour.

Visual Objects makes the fox trot.....22

CA has finally released Visual Objects. Colin Hume reviews this new RAD tool in the light of market competition from the likes of FoxPro.



OOP

Forms on the Web.....27

Chris Cant wanted more from the World Wide Web than boring views of text and pretty icons and bitmaps. He wanted input so he wrote it...

Canadian C++ clubber33

Watcom C++ 10.0 features in the third instalment of the EXE C++ compiler report by Rhea Systems.



SOFTWARE TOOLS & TECHNIQUES

Pollution in C and C++ land39

The problem with adding new keywords to any language is the serious risk of breaking existing code. Francis Glassborow discusses the new additions to C and C++.

Special agents.....43

There is an emerging family of software capable of gathering and assimilating information automatically. David Mery investigates.

Part play with OpenDoc73

OpenDoc is now in beta. Paul Smith describes the latest 'improvements' and explains how to create a real OpenDoc part.



OPEN SYSTEMS

It is not Unix..... 55

But it is GNU. Niall Mansfield presents a guide to building the high quality C and C++ compiler from the Free Software Foundation.

Terminal Blues 63

Peter Collinson ventures deep into the Unix kernel on a voyage to discover how the pseudo terminal mechanism works.



DEVELOPERS' CORNER

You're just sixteen 47

Install Windows '95 and it will appear to boot straight from power on. But dig a little deeper and you'll see our old friend DOS. Dave Jewell explains.

Email with MS-Mail..... 82

David Mery enhances the EXE Windows NT LAN by adding Internet email to MS-Mail.



COMMENT

Soapbox 13

The Internet is supposedly the brave new frontier of the 1990s. But how many people actually know how to use it, let alone protect themselves on it? It's time we enlisted the help of the experts says Melanie Welsh.

Mayhem..... 60

Jules doesn't want to see computers in high street stores any more. But maybe that's because his neighbour has just bought one. I think you can guess who's been asked to make it work...



EXE SUBSCRIBERS CLUB

Letters 77

Classical commenting. Hear the music!

Ctrl Break 78

It's official: Cupid is a software developer. Galactic Civilisations prize draw. And official denial that MS will be buying the Vatican.

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And the majority of Delphi is written in itself! I don't think Visual Basic can make the same claim. Maybe the next version of Visual Basic will be written in Delphi? Stranger things have happened...

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The generation game

The terseness of C and C++ is dragging software development into a quagmire of code lines. **Cliff Saran** suggests an answer.



20 years ago people could not have imagined that their homes, their lives and their work would be dominated by computers. Computers were clumsy hulks of metal with flashing lights and switches which needed constant attention. Science fiction novels and films of the fifties and sixties depicted computers as autonomous monsters capable of world domination. Even now this is unfathomable. Computers, then, were simply not up to the job. Housewives the world over eagerly awaited the birth of the domesticated robot. But he never came.

20 years ago two engineers at AT&T Bell Laboratories invented a computer language that would become the preferred method of writing programs for millions of software developers throughout the world. 20 years ago C was born.

The limitations of C were well understood when Bjarne Stroustrup began work on his approach to programming. Yet he still chose to base the new language upon C. For an industry that is evolving at an astonishing rate it appears that computing is stuck in a time capsule. It clings to an age when people could not possibly have imagined the extent to which the personal computer revolution would effect the way computers are deployed and used. Time for change is long overdue. How many developers have agonised over fruitless efforts because they knew they could have achieved the same result in half the time? How many man-years will be lost before developers change their attitudes and move towards better ways to write application software?

Object oriented programming may be the answer. The concepts are easily grasped. So easily in fact, that managers seem convinced OOP is the right way to go. This may be the case. OOP could well be the 'right way' to proceed. But one thing is certain, C++ is not. As a derivative of another language it combines the fundamental drawbacks of C with further complexity courtesy of Stroustrup's OOP features which appear to have been strapped on as an afterthought. C needed modernising. It needed objects. At the time C++ appeared to be offering a viable way to proceed. With the millions of lines of C source code in existence it certainly offered a practical, evolutionary path. But C++ is not the clean break with tradition that the computer industry desperately needs for it to meet the demands on software for the 1990s.

The answer is a family of programming tools which developers have shunned for

years. Programmers simply do not see fourth generation languages as tangible alternatives to C and C++. They encompass nothing of the piety that makes a 3 GL attractive. They are considered vendor-specific which makes the developer particularly vulnerable to the whimsical activities of the tool's producer. And by virtue of their interpreted nature they will invariably offer second class performance when compared to a compiled language.

So developers ridicule 4 GLs. But they deceive themselves. If they stick adamantly to writing ANSI C their source code will be portable to different hardware and software platforms. But once they move from standard libraries to a third party library, they immediately become influenced by the producer of that library. Their decisions, as to what platforms they support, how many developers they allocate to the project in hand, will depend on practical issues such as the availability of the library on other platforms as well as commercial ones such as licences and potential royalties. And if the third party company should decide to alter the interface to its library the project will need to be changed. Such changes do occur. And they occur more frequently than developers would care to admit. Microsoft is arguably the biggest offender. The move from OLE 1.0 to OLE 2.0 could potentially have affected every single piece of Windows application software on the planet. Borland too has changed one of its APIs. Remember the move from OWL 1.0 to OWL 2.0 and the kludge translation tool that Borland shipped in order to convert code?

As to speed. Well there is no doubt C and C++ are faster because they are compiled languages. But the question is whether the difference in speed is significant enough to justify the effort needed to attain it. And on super fast hardware, will the difference really be that noticable. Probably not.

A serious problem with the computer industry is an underlying reluctance to change. Enthusiasm to accept the latest fad is a veil beneath which hides the ugly face of ignorance. When the excitement has gone the people return to their tried and trusted ways. They said CASE didn't meet their expectations; how long before OOP follows in its wake? Perhaps in years to come people will look at this era in computing and mock our millions of lines of C as we today mock Cobol.

Cliff Saran



A visionary steps down

Philippe Kahn is often credited as the man who brought cheap software development tools to personal computing. In the wake of his resignation

David Mery searches for the real Kahn.

Philippe Kahn announced on January 11th that he had resigned as president and CEO of Borland International. He still remains Chairman of the board and an employee of Borland. Gary Wetsel, who joined Borland last November as its chief financial officer, was named president and appointed as a board member. He had already assumed the role of executive vice president since Keith Maib's resignation. According to *Newsbytes*, Borland's spokesperson Steve Grady said that Wetsel will also 'assume the responsibilities of the vacant CEO post [but] without the title.' Kahn will now focus on long-term planning, international business and other special projects. Gary Wetsel commented, 'Philippe Kahn is a true visionary [...] his skills and vision will continue to be a valuable asset to the board of directors and the industry as a whole.'

Last March when Kahn laid off 200 employees, including some managers, he said: 'there comes a time in a company's history when the team and the leader get out of sync. Either the leadership or its execution doesn't work. If it is the leadership, the visionary has to go. If it is the execution, the team has to go. In this case it was the execution!' Or was it? Pondering his New Year's resolutions Kahn obviously revised his judgement, even though some analysts consider that his recent move isn't enough.

In March an annual loss of nearly \$70 million was announced. The layoffs and the sale of Quattro Pro to Novell (for \$145 million) were not enough to brighten Borland's future. For the fourth quarter 1994, Borland is expected to announce a loss and a decline in revenue. After the resignation, Borland stock was at \$7, three years ago it peaked at \$86.75. Borland will probably present a restructuring plan soon. The *Associated Press* reported that 'cuts could total a third of the company's work force of 1,700'.

For sale...

The sale of Quattro Pro looked like a move to concentrate on the software developers and the corporate markets, but the recent acquisition of Dashboard from Hewlett-Packard goes against this strategy. The acquisition was considered surprising because most potential customers have already bought Dashboard or installed it from a free cover disk. Over the past years it has been rumoured on several occasions that Borland was for sale. The names of Sybase and Novell have even been mentioned. The current situation should fuel new rumours, if not an effective sale.



Borland's ex-president and ex-CEO

Doug Chance, also on the board, resigned at the same time. The official statement gives a totally unrelated reason for this departure: 'Chance said he resigned in order to devote more time to his role as president and CEO of Wyse Technology.'

A visionary, a sailor, a musician...

Who is Philippe Kahn? He's known as the founder and president of Borland but is a much more complex character. In addition to computer software his vocations include music, chess and sailing. He has been credited with both the successes and failures of Borland. French born, he studied Pascal at the University of Zurich with Niklaus Wirth, the language's inventor. After teaching mathematics at Nice University he emigrated to the USA in 1982. The legend goes on to say that he only bought a one-way ticket.

He created his first company in Silicon Valley. It was a consultancy called MIT, like the Massachusetts Institute of Technology, to impress its potential clients. It worked until he received a letter from the MIT, the real one, asking him to stop using the same

acronym. For one of MIT's contracts he wrote a Pascal compiler with some friends. After trying to sell the language without success he created Borland International. The company was apparently formed because he didn't have a green card and thought that nobody would ask him many questions if he was president of a company. He legalised his situation only two years later.

It all started in 1983 in an office located on top of a garage with only one full-time employee, himself. After his first ad for Turbo Pascal, in *Byte*, he received about \$100,000 worth of orders in one month. That was the beginning of the success story. Many analysts accused him, then, of using a gimmick to get into the industry. Turbo Pascal was sold for \$49.95 when competing products were priced at over \$500. But Borland continued its aggressive pricing strategy and still managed to make money.

The success of Borland has always appeared to be proportional to the size of Kahn's boats. In 1983, Turbo Pascal sold like hot cakes and Kahn bought a 20-ft sailboat. In 1984, SideKick joined leading business products on Softsel's Hot List and Kahn got a 37-ft boat. In July 1986 Borland became a public company and Kahn invested in a 70-ft racer and won the Pacific Cup Race.

But not all Kahn's investments were well considered by analysts and investors. In 1990, he decided to build a new HQ for all of Borland's staff. The project was grandiose and included tennis and squash courts, gym, etc. But the decrease in sales in 1992 and 1993 made the project a costly decision. Kahn was accused of being more concerned with the health of the staff than the health of the company.

And the new building was not the only spending criticism that Kahn encountered. He used \$300,000 of Borland's money to produce three CDs on which he played sax and flute. He eventually reimbursed Borland. The CDs were sent to journalists, customers and staff.

Philippe Kahn changed the industry by creating a market for low cost development tools. Borland was one of the first companies to generalise the in-house use of OOP. He wanted to create another change in the software industry with OO technology. Whether or not this will save Borland is for another to decide.

Borland is on 01734 320022.

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JUNE 1994



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A matter of trust

Antitrust is making a stir again at Redmond. Despite Microsoft's agreement with the Justice Department some six months ago, last month six companies filed a motion to block it. The companies concerned are not known as they fear retaliation from Microsoft. Rumour has it that the whole incident came to the fore when the federal judge dealing with the case was given a copy of James Wallace and Jim Erickson's *Hard Drive*. Certainly the account of how Pen-Windows came into existence is most damning.

Warp Power...

While the launch of Windows 95 appears to be lagging behind, it seems that sales for OS/2 Warp are definitely on the increase. According to IBM sales of OS/2 in Europe have increased by 120% in the last 12 months. It also claims to have a strong presence in the preload market. Unlike Microsoft which says it will ship Windows 95 when it is ready, IBM's marketing message is that OS/2 is available now. However, the long-awaited PowerPC port has only just gone into beta. OS/2 for the PowerPC comprises OS/2 Warp plus an application development environment. Shipping is not expected until next year.

Dial a Pentium

Anyone who is concerned that their Pentium may have the notorious floating point bug can have it exchanged. Intel, it would seem, has accepted it was wrong to run a policy of replacing processors depending on *need* rather than *request*. Even though the bug occurs, according to Intel, once every nine billion instructions, the company is moving over to the new, updated processor and says it will be able to ship sufficient replacement parts to meet demands during the next few months. If you would like to do the replacement yourself Intel will offer technical support. Phone 0793 423400 for details.

Geared to developers

Make a note in your diary for the EXE Show, taking place between 8th and 9th of June at the Royal Horticultural Halls. Among the companies exhibiting are Computer Associates, Lotus, Powersoft and Gupta. Over the two day event we are expecting to attract over 5,000 developers. As you would expect from the UK's leading software development title there will be a development seminar programme accompanying the show. Over the coming months we will keep you up-to-date with a list of speakers and seminars which will be running. Further details on the EXE Show can be obtained from Tim Macpherson on 071 2875678 x3425.

We are Windows-friendly...

At the end of last year SCO emphasised the extent of its commitment to making Windows and Unix work together: it purchased Visionware. Lars Turndal, SCO chairman and CEO described the present state of integration as 'the left hand doesn't know what the right hand is doing.' To address this SCO will be focusing on four areas. It intends to provide tools to connect Windows desktops to Unix servers. Management of Windows clients will occur centrally from a Unix platform. On a PC, SCO will work to make Unix applications have the look and feel of Windows. Only then will SCO allow Windows and Unix applications to run.

Visionware is the company which implemented ODBC on Unix. Commenting on the acquisition, co-founder Tony Denson said his company shares SCO's vision of integration between Windows and Unix. 'SCO's customers will benefit immediately from Visionware's current products; Visionware customers will also benefit from SCO's global support services and worldwide distribution channels.'

A recent IDC report put SCO at number one in the Unix market for Europe, with 23.6% of the market share compared to Solaris, its closest rival with 17.7%. Closer integration with Windows should increase sales. Alok Mohan, SCO president and chief operating officer claimed SCO is the Unix company with the most complete level of integration. 'No other Unix vendor has a serious Windows-friendly strategy.' SCO can be reached on 01923 816344.

Show me Windows 95

With carefully chosen words Microsoft announced 'Windows 95 *may not* be available until August 95. The slippage is attributed to Microsoft's intention to test the new operating system 'vigorously'. More likely it is busy ironing out the bugs in the recent beta 2 release which Microsoft says has been shipped to over 48,000 beta testers so far. Brad Silverberg, senior vice president of Personal Systems explained, 'given the sheer breadth of Windows 95, shipping it may take us longer than we had originally anticipated.' Windows 95 is expected to be the big 'crowd puller' at the Windows Show which is taking place between 28th of February and 3rd of March in the ground hall at Olympia, London. Windows 95 will be running in the *Test Drive* centre. And there are rumours of a big launch. Well, since it can't be Windows 95 I imagine the company is planning to kick off its expanded beta programme at the show. Microsoft is expecting several hundred thousand participants.

Come down to Sandown

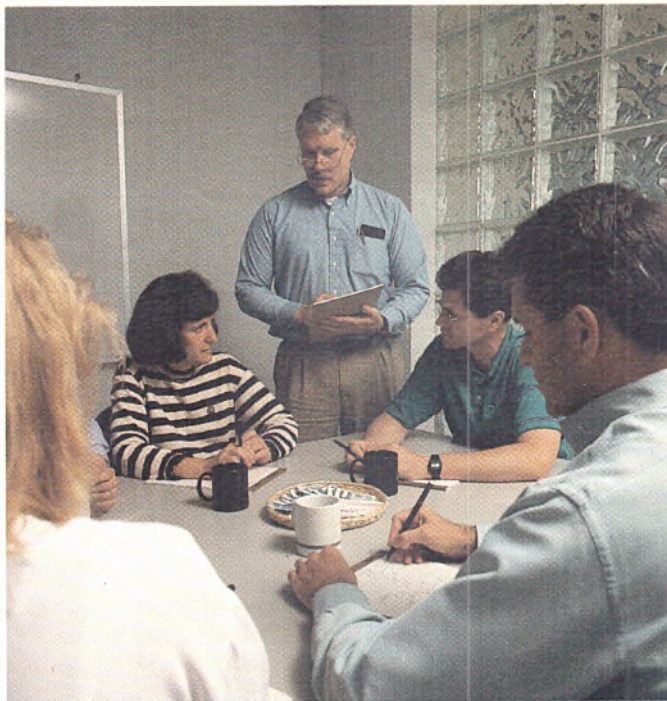
The first Software Developers Forum will be held on February 8th and 9th. The two day event will comprise an exhibition, a seminar and a contest running in parallel. Amongst the exhibitors will be Computer Associates showing Visual Objects, so if you've been intrigued by the articles run in EXE this month, you'll have the opportunity to look for yourself.

IBM will show its visual environments VisualAge and VisualGen. Apple is promising to show the Newton communicating on a GSM network. Symantec will present its new C++ compiler (see EXE January). Also present will be Informix, Magic Software, Progress and Nat Systems... There should be about 60 exhibitors. 14 of them are organising free seminars covering a wide range of subjects including Client/Server, RAD, OOP and software testing.

The Forum is taking place at the Sandown Exhibition & Conference Centre. Come and see us on the EXE stand. Not only are we one of the event sponsors, we're also organising a contest. During the first day, developer teams will compete in the *EXE Developers Challenge*. This is the first year the contest is being run. 25 teams with two developers in each will have eight hours to develop a 'payroll giving database' system for the RNIB in front of a live audience. The winning team will compete later in the year in America. Access to the exhibition is free. For more information about the Software Developers Forum contact Interactive Exhibitions on 0181 5415040.



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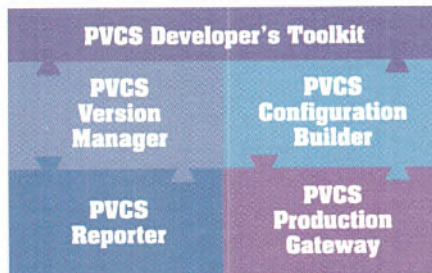
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VisualWorks evaluation

Since ParcPlace Systems sold its C++ Business Unit to Openware Technologies, it is now focusing on its Smalltalk product line and VisualWorks. To convince companies that Client/Server with Smalltalk development is a valid option, ParcPlace is organising evaluation programmes. They are composed of one day training, a 30 days evaluation of VisualWorks 2.0 and one day mentoring from ParcPlace's support team. Russell Prince-Wright, director of Northern European Operation states that the goal is for organisations to 'assess how appropriate the tool is to their particular project and corporate requirements, and to discover the issues involved before making a large investment.' The programme costs £500 and is already scheduled for 22nd February and 22nd March. ParcPlace Systems is on 01252 719100.

Graphics a new dimension

Graphics Server 4.0 is now available from Bits Per Second. The main enhancement is support for true 3D graphs. The developer has control over rotation, elevation and perspective. New statistical charts have been added plus there is now a surface contour plot feature. Graphics Server can also produce *Wall Street* open-high-low-close charts. Bits Per Second says performance has been improved in the new release. For instance, real time data can be displayed in a scrolling window while being updated several times a second. Graphics Server 4.0 is shipped with 16 and 32-bit versions together with VBX/OCX custom controls, a Visual C++ class interface and property-based DLLs. The price is £245. Bits Per Second is on 01273 727119.

Version API

RCE is a new version control engine from Xcc software and Walter F Tichy, the author of the 'classic' RCS Unix tool. RCE is a multiplatform library with a programming interface for revision and version control. It is backwards compatible with RCS. Rather than store entire versions, RCE stores only the changes, or *deltas*, between versions. Xcc claims that the algorithm it uses can handle all data formats including binary files, images and sound. It also suggests that RCE has a higher compression ratio to RCS.

It is being shipped as a DLL or statically linked library. Supported platforms include Windows, NT, OS/2 and Unix. The API provides calls for revision and version information and project management. Several built-in dialog boxes are also present. The price is \$1,990 (Windows) and \$3,300 (Unix). Xcc software can be reached in Germany on 0049 721 616474.

CAD for Visual Basic

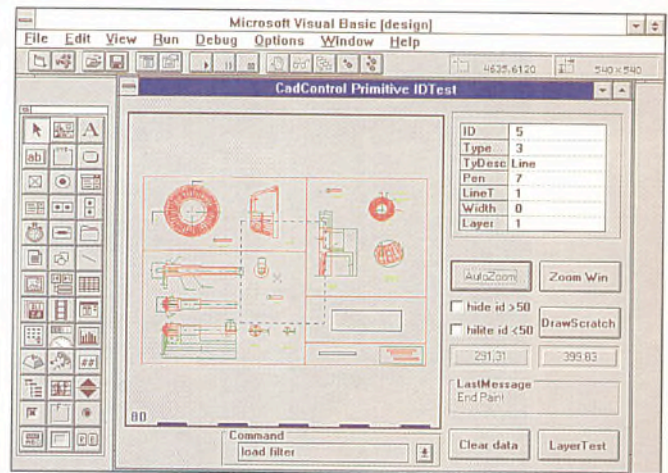
Softcover has developed a new custom control which gives Visual Basic developers the ability to add CAD to their applications. CADControl encapsulates the features of the company's ChoiceCAD application into a VBX control where it can be used as an alternative graphics engine. It supports TrueType fonts, bitmaps, DXF and

DWG file formats, snaps and multiple layers. According to Steve Hannath, managing director of Softcover, 'you can display 20,000 vectors in a few seconds and find the nearest one instantly.'

Combined with the built-in database facility of Visual Basic, Softcover expects CADControl to be used in application areas such as GIS, real estate, vehicle tracking and network management which require the combination of graphics and database access. When an entity is added to a drawing it is given a unique ID which can be used to interrogate or query the drawing. The ID can also be used as a key field in a database storing attributes of the entity.

As with most Visual Basic custom controls, CADControl provides a number of properties which can be set during design and at runtime. The appearance of the control can be altered and optional CAD facilities such as drag and snap, can be restricted. Softcover provides two methods for using the control in application code. There is the ChoiceCAD API and DLL which provides functions to create and interrogate objects in the CAD drawing structure. The second method gives Visual Basic programmers a mechanism for issuing commands to the control directly using the ChoiceCAD macro programming language.

CADControl is shipped with sample code for Visual Basic and Visual C++ which illustrates how to use the control, both with the API and with the macro language. Of course, being a CAD company, Softcover does impose one limitation on what can be developed with its control: you can't write a full-blown CAD program! CADControl is priced at £499, which includes a copy of ChoiceCAD. Applications built using the control are subject to a licensing fee ranging from £10 to £50 depending on volume. Softcover is on 0171 2592100.



CADControl inside Visual Basic at design time.

OLE in Poet

The new version of the Poet OODBMS includes several 'productivity' tools. The Workbench provides an environment in which developers can run the various tools for application development. Class Explorer is a browser which allows the developer to navigate the database schema interactively. Poet Explorer gives direct access to the database itself. There is also a new database administration tool which enables the administrator to monitor processes, reorganise databases and recover transactions. Full and incremental backups can be performed online, without having to shutdown the server and there are three levels of user access available.

The new version is able to store OLE 2.0 objects which can take advantage of the data security and transaction processing facilities in Poet. There is an optional ODBC driver for connecting to conventional databases. Full support of ODMG-93 is now present and there are ODMG-compliant classes in the C++ interface. A full ODMG C++ framework is expected by the end of the year. There is also the Poet OQL monitor tool which enables developers to query objects and navigate with a SQL-like querying language. At the time of writing a price was unavailable. Phone Silicon River on 0181 3167778 for details.

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Superbase95 already shipping

In line with Microsoft, Superbase appears to have appended a year denomination to its new product, Superbase95. However, the new version is for Windows 3.1, which is probably just as well otherwise you would have had to wait until at least August. Still compatible with previous versions, it implements 70 object types. The RDBMS can be programmed either with a visual interface or with Object SBL, but there is no need to decide right at the beginning which way to go. Object SBL code can be generated from the visual programming interface and vice versa. Superbase 95 supports ODBC OLE2, MAPI and VIM. It costs £239 and is available from Superbase 0171 3446996.

Plug and Play and Small BIOS

Phoenix claims that its new Plug and Play 'BIOS Extensions 4.0' is the smallest in the industry. It requires 4 KB for the P&P runtime services and 10 KB for Phoenix's P&P extensions. BIOS Extensions 4.0 supports PCI, ISA, EISA, PCMCIA and motherboard devices. It detects all P&P cards and configures them when a non P&P OS is used. When a P&P OS is run, only boot devices are configured by the BIOS; all others are configured by the OS itself. Utilities such as Intel's ISA Configuration Utility and Configuration Manager are supported. Phoenix has participated with Compaq and Intel in the development of the P&P BIOS specifications. It is also a member of the Steering Committee of the P&P Association. Phoenix is on 01483 301444.

Monitor from Windows

Microtec Research has introduced a Windows version of its Xray Monitor. The code section of the monitor program occupies approximately 5 KB and can reside either in ROM or RAM. On-target debugging facilities include instruction breakpoints, source and assembler debugging, single step, procedure traceback and watchpoints. According to Microtec Research the target processor can be run at full speed. A configuration tool is provided for tailoring the Monitor for a specific target platform. Xray Monitor supports the entire 68K family. Microtec Research is on 01256 57551.

With a little help

SOS Help! Info - Author is a Windows help authoring software. Without leaving the program, it is possible not only to write help files but also to display the information as WinHelp would. When happy with the result, a .HLP file can then be generated. An API is available to provide context sensitive help. The software costs £195 and is available from Guildsoft (01752 895100).

Prepare for Phoneday

On April 16 (not April's fools day although some may consider it to be the worst kind of phone company prank) most, but not all, UK phone numbers will change. In fact the change has already been made. What will happen in April is that the old system will stop working. So, from that date, all our phone numbers will have to be changed. That includes phone memories, fax machines, Filofax, remote alarms, phone books... And *computer records*

The change is far from being straightforward. All geographic codes will have their prefix changed from 0xyz to 01xyz, but for five cities the code is to be changed completely. The international prefix changes from 010 to 00. The emergency code will no longer be 999 but instead 112. All mobile phones and special numbers like free phone numbers will remain unchanged.

Subtle Software has prepared a package to automate the necessary changes to computer records. It includes no less than six products aimed at the PC market. Most of them can be adapted to Unix or mainframe environments. According to Subtle Software 'there are of the order of 75 different *exceptions* which conversion software has to deal with.'

The base product is FixPhone for Windows which includes converters for dBASE, Clipper, FoxPro, Paradox, Access and ASCII format. A Windows DLL, a DataEase Custom Defined Function and Gupta SQLWindows SAL application are bundled with FixPhone. The DLL scans a string for a 'pre-Phoneday' phone number and returns the corrected string or an error if a problem occurs. The CDF does the same thing for DataEase and the SAL application is a converter for Gupta SQLBase. If you want to port the code to an environment other than Windows or include it in a bespoke application, then the ANSI C source code is available.

Rather than modify any data, another of Subtle's products, Phoneday Filter for Windows, corrects phone numbers displayed on screen or entered via keyboard. Phoneday Filter monitors selected fields within dialog boxes and updates the information 'on the fly' when it is displayed or entered. It is advertised as being 'compatible with most applications which use Windows dialog controls for displaying data and getting user input'.

FixPhone for Windows costs £49, the C source code is at the same price. Phoneday Filter for Windows is priced at £149 for 5 users. Subtle Software is on 01494 783229.

Internet freeware tools for NT, lures gurus away from Unix

Edinburgh University has released the first version of its Internet Toolchest for NT. The various tools were developed over a period of a year by the Microsoft sponsored 'European Microsoft Windows NT Academic Centre' (or EMWAC) hosted at the University. The goal of EMWAC is to make NT as attractive, if not more, than Unix especially for Universities. To this end all tools are freeware. These include Web, Gopher and WAIS servers. Only executables are freeware but source code licences are available.

Currently two WWW sites are already running with HTTPS. These are at the Microsoft Web server site (<http://www.microsoft.com>) and the EMWAC site (<http://emwac.ed.ac.uk/html/top.html>). EMWAC's Web server is running on a Sequent Win-Server 3000.

HTTPS requires an Intel, Digital Alpha or MIPS platform with NT and at least 16 MB of RAM. TCP/IP also needs to be installed. A PowerPC adaptation is currently in progress. HTTPS implements the HTTP/1.0 protocol and runs as a Windows NT 'service'. Configuration is done through a Control Panel 'applet'.

The freeware version doesn't have any security as it is primarily intended for academic sites. A 'Professional version' is planned which will implement firewall features. This version will be commercially available from Process Software. For more information email bourne@process.com or register to the mailing list for 'NT-based Web Server application development' called webserver-nt@mailserver.process.com.

All the software mentioned can be downloaded from EMWAC's site. The best route is probably to connect at its home page <http://emwac.ed.ac.uk/html/top.html> and follow the links from there. EMWAC's Web server also mirrors Microsoft's site.

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C++ and class libraries have made the GUI development much easier. After all, it is only logical that more and more developers think in objects. But object orientation shouldn't end at the user interface programming level.

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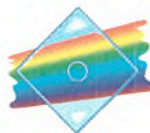
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> CIRCLE NO. 932

SOAPBOX

Yet another teenage hacker makes the front page. **Melanie Welsh** believes that something constructive should be done about it.



Three days into '95 and the *Independent* launched its first hacker 'scoop' of the year. The 16 year old boy from Tottenham, north London who used the Internet to watch secret communications between US agents in north Korea during the spring '94 nuclear inspection crisis. 'Datastream', as he likes to be known, was not the only hacker to break into the US defence computers, but he was the one to cause the most damage. Over a million user passwords were compromised as well as the 'military readiness' of the US Defence Information Systems Agency.

He was actually arrested in July of last year. It took a further six months for the national newspapers to latch on to this story. Even then it was given scant attention.

Maybe people are bored with stories of errant hackers flitting amongst the computer records of the great and mighty. After all, this is no longer a new phenomenon. You may remember the case of Robert Schifreen, a former editor of EXE, hacking into the Prestel account of Prince Philip in 1983. He was acquitted because what he had done was not at that time illegal. This, Schifreen claimed, was exactly what he wished to point out. 'A new law is needed, and it is needed very fast,' he commented. Regina vs Schifreen and Gold eventually did the trick, resulting in the Computer Misuse Act which will be used to prosecute Datastream and his Internet accomplices.

Perhaps this prolonged exposure is why people didn't seem to take that much notice of such an embarrassing and potentially dangerous breach of security. Whether we like it or not, our little British lot, is still pretty much tied up with that of the US. A threat to them could be a threat to us. In the light of the BT hacker it would appear that we all need to be sitting up and taking notice anyway.

But a brief survey amongst my 'non-boffin' friends revealed a quite startling lack of knowledge. I have *one* friend outside of work who knows both what the Internet is and how to get on to it. None of my friends

are particularly ignorant, or cocooned against the 'real' world. Yes, of course they've heard some vague mutterings about the Information Superhighway. They realise that it's the trendy phrase for '95. But wasn't Kylie Minogue *le mot* for '94? They don't know very much about her either.

I guess this is the very crux of the problem. It takes a fair old while and a healthy dollop of imagination on the part of the listener to explain the Internet, or more pertinently, its potential. And if you don't really understand the potential benefits, you're not going to start thinking about the potential dangers. Which is why it didn't really surprise me to hear the results of a survey by Logistix at the end of last year. It found that approximately 60% of companies on the Internet were exposed to online attack. Everyone's so busy scrambling to get on the highway that they've forgotten to shut the doors properly, never mind fastening their seatbelts.

The urge to hack is really quite a natural one amongst any intelligent young person who has a basic understanding of computers. Computers have always been put forward as infallible objects. They are said to be incapable of right or wrong as they work purely on logic. The need to push things to limit, to see just how far you can go is a very human one. Hackers, for the most part, do not 'test' the system for profit or gain, as the House of Lords admitted in the Robert Schifreen case.

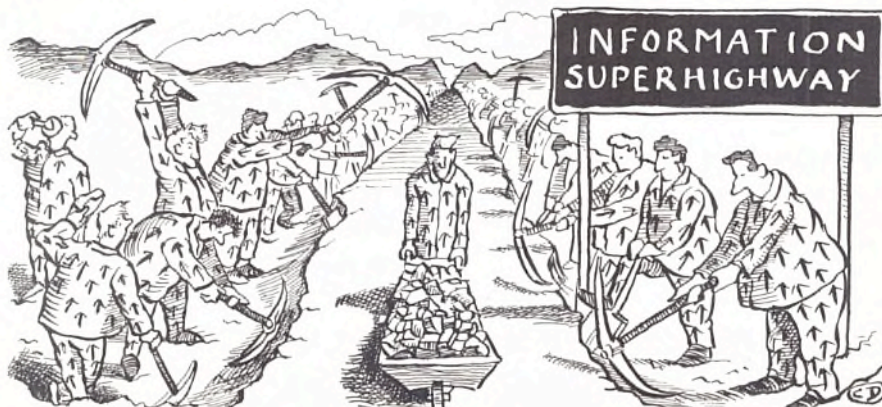
The US already has its own Datastream. He is a young man who calls himself Phiber Optik and who spent 11 months of last year in prison for 'hacking' into computer phone systems. What he did was illegal and, arguably, wrong. But how can you argue with a 16 year old that 'stealing' telephone calls from a company that makes widely decried profits every year is 'wrong'. How can we

turn round to Datastream and tell him that watching the US agents in north Korea is wrong when the very idea of anybody owning nuclear weapons is insane.

For the most part, hackers so far have been intelligent, curious people who have pushed back the boundaries of knowledge or law, or both. When Phiber Optik went to court, the sentencing judge said that by his actions Phiber had chosen to be a messenger for the hacking community. And that he, the judge, had no option but to send a message back. It was the wrong message.

There are very few people out there who have bothered to educate themselves about the Internet, 'hacking' and computing. If, when we find them, we promptly throw them into prison we are quite literally throwing away a very rare resource of talent. We should be enlisting the help of the Datastreams and Phiber's. Okay, so they have to be 'punished' in some form for messing around in other people's files. But it has been proven time and time again that prison is a counter-productive method. Why not some kind of community service which could utilise their talents? Before Phiber was sent to prison he was a teacher at the New School for Social Research in Greenwich Village. For eleven months those children were without their talented tutor whilst he brushed up on the finer points of criminal techniques.

The concept of changing British law to discern between different categories of criminal is far too weighty for this small *Soapbox*. What I'm trying to say is that many of you reading this are also very knowledgeable about the Internet. Share that knowledge with the people around you. If you don't believe that Software Developers can make a difference, talk to Robert Schifreen. He changed the law. What can you change?



Prime

Cliff Saran gets his mitts on a gamma release of Delphi, the Great White Hope for Borland in 1995. Or is it?



With the sale of Quattro Pro last year, Borland moved from being a producer of office productivity tools for end users to a company that specialised mainly in databases and programming languages. Its database product family comprised the DOS and Windows versions of Paradox and dBASE. Its primary development tool was Borland C++, then Borland Pascal. The company appeared to have a strong position at the low end of the database market and seemed to be faring as well as could be expected against the Microsoft Visual C++ marketing machine.

Although there were two areas of the database tools market in which it lacked any real presence. The first of these is in the database server market. For the last year, the message coming out of Borland was that Interbase would be Borland's great knight in shining armour to tackle the likes of Oracle and Sybase. But there were serious problems with Interbase, not least the fact that Borland was targeting the wrong audience.

The second area which Borland needed a foothold in was the RAD tools market. Object Vision, Borland's previous attempt at 'visual' programming was a complete failure. But during the last nine months Borland has been giving sneak previews of a

brand new RAD tool code named Delphi. I have been fortunate enough to attend a number of these previews. The general feeling among developers using Borland tools is very encouraging. While I have written briefly about Delphi in previous issues I thought now would be a good time to write something more in depth.

Test drive

Before I begin, I should like to warn in advance of the rather odd screen shots within the article. I installed the software under Windows 95. Well, Borland did say it would work. To confuse things even more I'm going to be using Windows 3.11 terminology throughout so I won't be making reference to any fancy folders... When installed (and it takes over 36 MB to complete) a new folder, errrm Program Manager group is created. Delphi is launched, would you believe it, by double clicking the Delphi icon. This brings up a 'classic' look IDE with a menu bar and two rows of toolbars below it. The title of the main window reads 'PROJECT1'. Three other elements comprise the startup screen of Delphi. The first is a blank form designer window with a grid called 'FORM1' which obscures the second window below it. The third component is the Object Inspector which is a tabbed dialog box that lists the properties and events for FORM1.

Now if I didn't know better I would say this was some new version of Visual Basic. But it isn't. The truth is revealed by unveiling the window obscured by FORM1. With a title bar reading 'UNIT1.PAS' there is no doubt that Delphi is Visual Pascal. Or is it? Certainly the Object Inspector is an equivalent to the Property windows in Visual Basic, albeit one with more panache. With the Events tab it is very easy to determine what events a form *can* respond to and which ones it *will* respond to if they occur at runtime. If an event handler has been written, its name appears in the 'value' field of the property dialog. Changing the value of this event 'property' to another name will change the name of the event handler procedure. A blank entry in the value field indicates that a specific handler has not been written, in which case the default action will occur if the event arises.

At this level within the form designer there is really no denying the inspiration be-

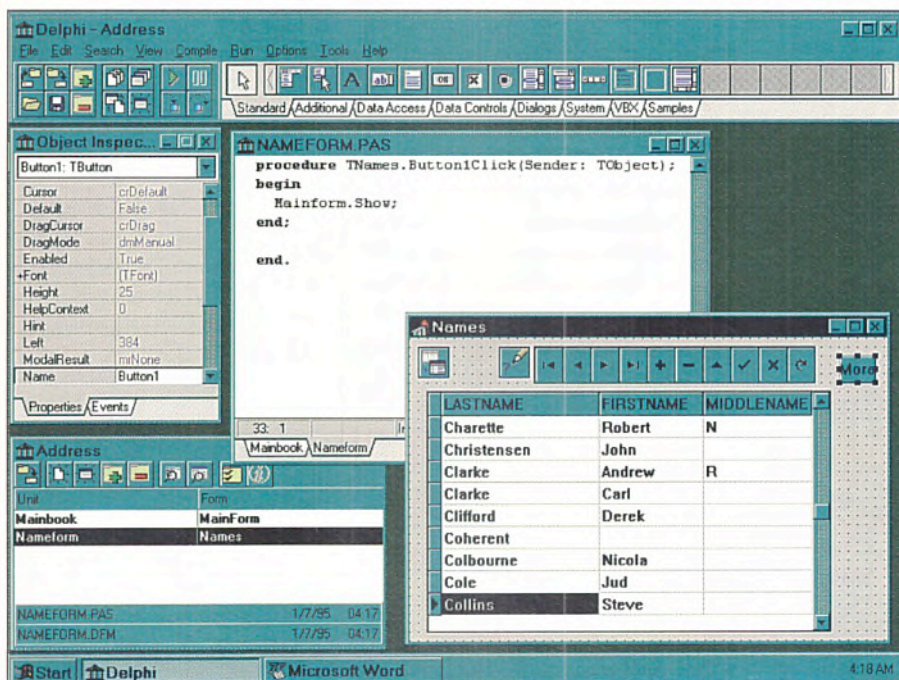


Figure 1 - The Delphi IDE showing Object Inspector and Form Designer

mover

hind Delphi. Dialog controls are selected from the toolbar and clicked into position on the form. Properties are set in a similar way. Double clicking a control on the form brings up a code window with a stub event handler definition. Of course, in Delphi the code is Pascal, rather than Basic, but the principal is the same. All the developer has to do is write the code to handle the event. Ignoring the syntactic differences between the two languages, event handling code is written in a remarkably similar way. While not identical, reading and writing properties and invoking methods in Delphi follow closely the Visual Basic way of performing these actions under program control.

But the real difference only shows up when the application is run. As in Visual Basic there is a VCR-style 'play' button and a **Run** menu for firing up the application under development. Either way, after the briefest of delays, the application will start up. Without any genuine application code, the application itself will not behave in a significantly different manner.

But by examining the contents of the project's directory you will find an executable. This is a standalone executable which can be copied onto another machine and then run. Unlike Visual Basic, Delphi

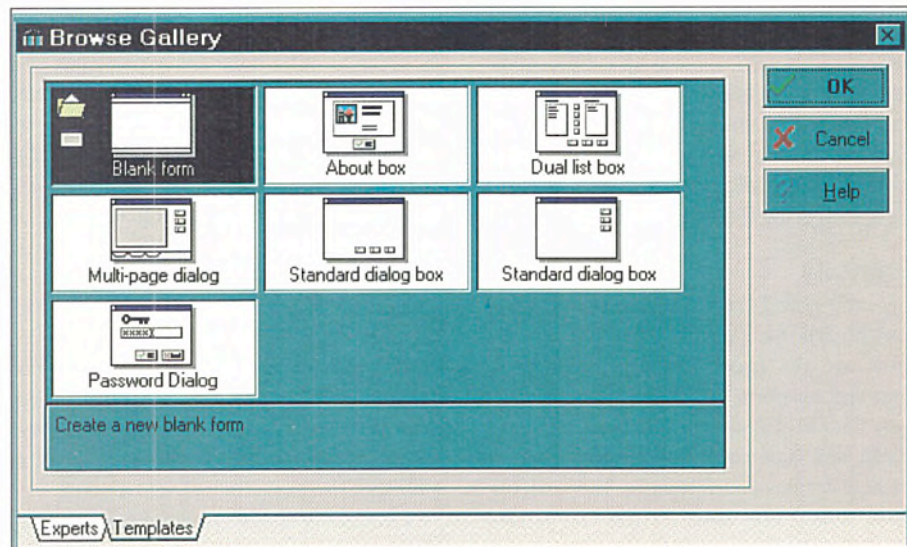


Figure 2 - Several template forms are included as standard

compiles application source code into native code. Borland claims that the Delphi compiler is the fastest in the world and estimates the compilation speed at 120,000 lines per minute. With that kind of performance, compilation speed is near instant. When the Play button is pressed, the application runs almost immediately. All that is missing is the huge delay of a C++ compile.

Tooling up

The Delphi IDE is illustrated in Figure 1. Applications are made of projects comprising several modules, or units, to use Pascal terminology. The simplest application containing one form is built from a single Pascal unit (.PAS) and a project file. Delphi generates a binary file containing the form definition, a resource file and a makefile. Source code for event handlers is added to the .PAS unit. From the **File** menu, **Add File** is used to add forms and Pascal source code units to an existing project. **Remove File** does the reverse and deletes them from the project.

Borland uses the generic term 'components' to describe a whole range of add-ons that can be plugged into Delphi. These include VBX custom controls, although OCX is not supported. Unlike Visual Basic, the **Add File** menu option does not add a component to the tool box. Its purpose is to add files to a project. Instead the developer adds a component through the **Options/Install Component** menu. So, rather than associate a particular add-on with a specific project, in Delphi the add-on is associated with the environment itself. Once installed, the component is readily available to *all* Delphi projects. Clearly this approach is superior to the alternative in Visual Basic in which custom controls are added to the project itself.

Whilst there is a facility to add new components, Borland provides a bag full of pre-

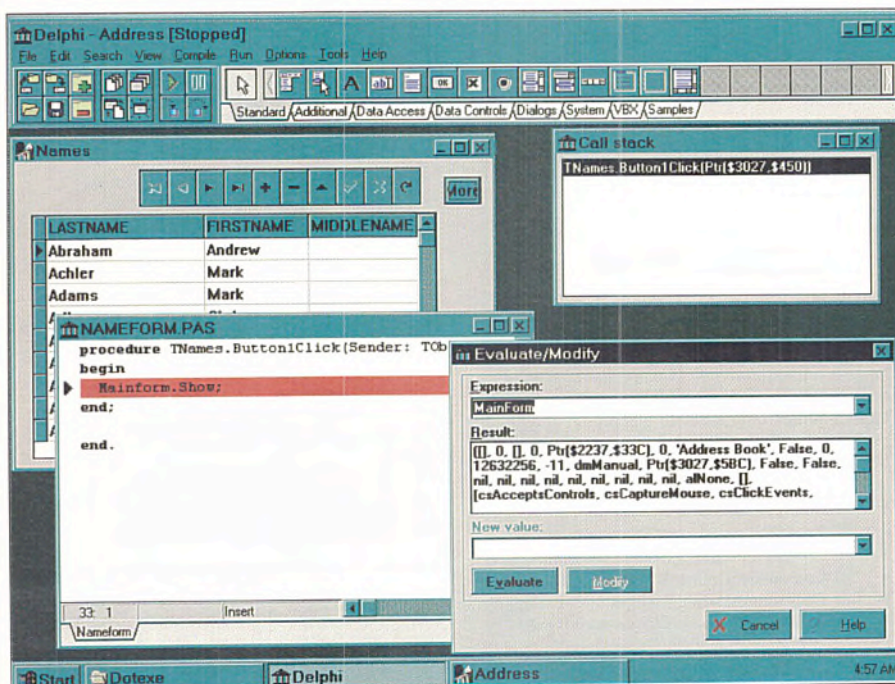


Figure 3 - Debugging session with call stack and Expression Evaluator

installed components to keep even the most demanding developer happy. As well as the standard Windows controls, Delphi includes popup menus, tabbed dialog control, a grid and a media player control panel. OLE container as well as DDE client and server capabilities can also be added to a form from the components toolbar. Unlike the two dimensional toolbox of Visual Basic, Borland's components toolbar is layered. A tab control is used to bring up a different selection of components. Since they are organised into logical groups it is relatively easy to find a particular component in the tabbed toolbar. Better still, tool tips is also available by default in the Delphi environment.

Shortcuts

Up until now I have discussed features of Delphi that are similar to Visual Basic. So what are the major improvements? Well, first and foremost is the compiler technology. Delphi will always be ahead of Visual Basic and any other interpreted environment in terms of performance. But performance is just one issue in the competitive market of RAD tools. At least as important, if not more so, is the ability to create robust applications quickly and easily.

With this in mind Borland has provided a substantial toolbox of components in Delphi. At a higher level it has included several template forms that save the developer from having to draw them himself. See Figure 2. These include About box, Dual list, Multi page, Standard and Password forms. Selection is made when **New Form** is chosen from the **File** menu.

Along with these there is also a Database Expert for creating all those important database applications. You can either create a simple data entry form or a master detail form for displaying records in one-to-many

relationships. The developer then selects a table and chooses the fields to include on the form. Delphi's Database Expert gives three possible ways to arrange the fields on the form. These are horizontally, vertically or in a grid. Once all the parameters have been specified Delphi will create a form, with the field names becoming labels on the form.

Living data

In order to build database applications the components toolbar includes two additional tabs. One contains data access controls; the other contains data aware control. The relationship between the two is that a data access control provides a link between a physical database table and a data aware custom control. As with Visual Basic, the concept of a database maps onto the name of the directory in which tables reside when accessing Paradox and dBASE files. A table is not directly linked to a data control. Instead it goes through an intermediary Data Source control. This can connect either to a complete table with the Table control or to a query.

Database-aware versions of the standard Windows controls are available, including a data-aware bitmap control. A powerful feature of Delphi is that once a link to a database table has been set up data becomes immediately available to the data-aware windows control simply by setting the **Active** property of the table or query to **True**. Thus, 'live data' is available at design time. This is a particularly useful facility that has found its way into a number of Borland database products. It can be used in Delphi to check that a SQL query is returning correct results without having to run the application in its entirety.

To catch a bug

The debugging features of Delphi are up to

the standards developers expect from an integrated Windows debugger. As expected, it supports breakpoints and watchpoints. There is also an expression evaluation window as shown in Figure 3, plus a call stack. Standard debug features such as single step, running to cursor position, stepping into a procedure and skipping a procedure are all supported. Lower level debugging is available with Turbo Debugger shipped with the product.

Speaking objects

As I explained earlier the language of Delphi is Pascal. More precisely it is Object Pascal which in fact is Borland Pascal. This is a strongly typed language yet is as easy to program in as Visual Basic. It appears to be a derivative of ISO Pascal. Like its forefather, Borland Pascal, Object Pascal is fully object oriented and supports **classes** as in the C++ understanding of OOP, with **public**, **private**, methods and data fields. However, rather than stick with its much thwarted OWL (Object Windows Library) application framework, in Delphi, Borland has decided instead to implement an entirely new class library called the Visual Control Library (VCL).

An attractive feature of Delphi is that whenever a form is changed at design time, such as when a new component is added, the source code reflects the change immediately. Each form in a Delphi application is a class derived from **TForm** in VCL. Components such as edit fields are also classes that are added to the definition of the new class as instance variables. Event handlers simply become methods, ie procedures in the new class, as illustrated below.

```
type
TNames = class(TForm)
    DataSource1: TDataSource;
    DBGrid1: TDBGrid;
    Query1: TQuery;
    DBNavigator1: TDBNavigator;
    ShowF: TButton;
    procedure ShowFClickIt
    (
        Sender: TObject
    );
private
    { Private declarations }
public
    { Public declarations }
end;
```

This shows a class **TNames** derived from **TForm** that contains a data source control, a data-aware grid, a query, a database navigator control and a button. The developer has provided a handler for the **Click** event of the button. Remember, none of this code was written by the developer. He simply

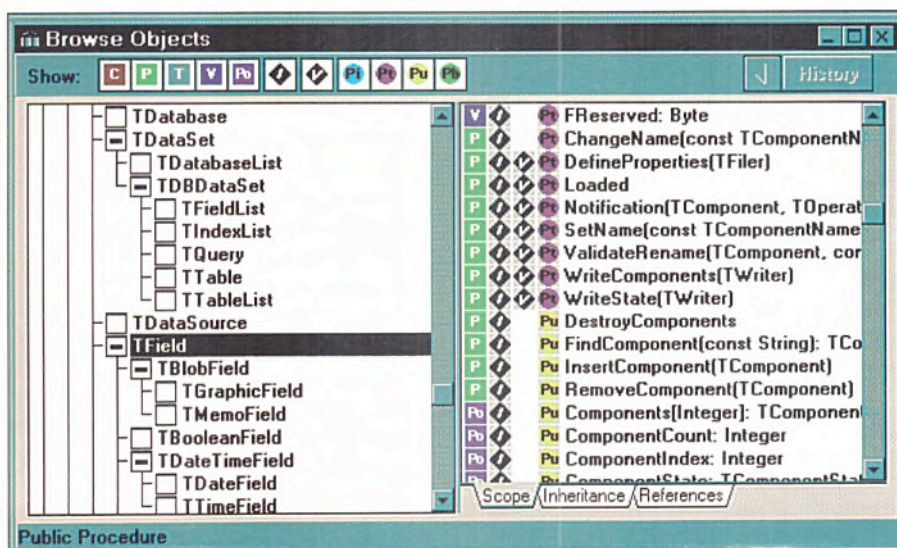


Figure 4 - The Class Browser in use

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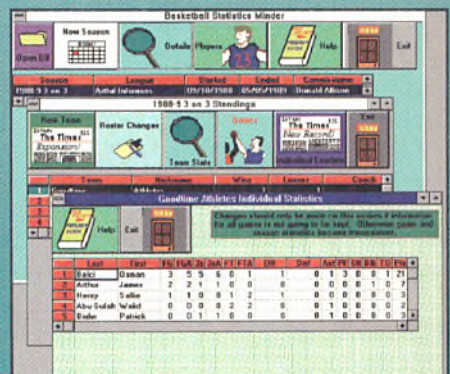
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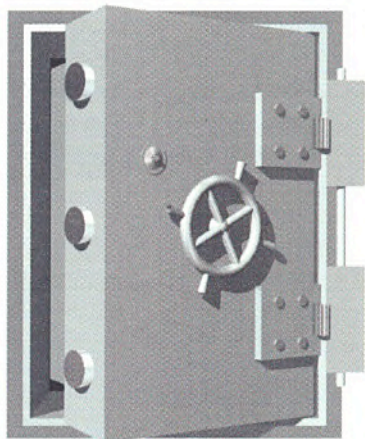
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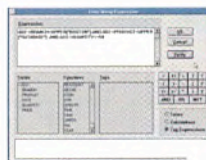
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drew the components onto the form and doubled clicked the **Show** button to create an event procedure for the **Click** event. The source code for this is as follows.

```
procedure TNames.ShowFClickIt
(
  Sender: TObject
);
begin
  MainForm.Show;
end;
```

Notice how the **Show** method for another form called **Mainform** is being invoked by this event handler. Properties can be accessed at runtime using the 'dot' notation in a similar manner. Given that the developer only had to type the single line **Mainform.Show**, it is easy to see how closely Delphi resembles Visual Basic. However there is a notable difference which is rather annoying. Since everything must be declared before being used, the elegance of the language becomes lost when it is necessary to access external Pascal units. In particular, in the above example, the **uses** section of the unit must contain the name of the unit that defines **Mainform**. However in the pre-release version of Delphi, this must be added manually. With all the automation embodied in Delphi I think it is an oversight on Borland's part that it didn't come up with a better, more intuitive mechanism.

Borland has provided a class browser which is shown in Figure 4. This shows whether function is virtual or inherited and if it is private, protected, public or published.

Docs

While it is often dangerous to assess final documentation on pre-release material, I must admit that what I was given appeared to be pretty comprehensive for an unfinished product. The *User's Guide* is divided into three parts. First there is a tour of Delphi and the form designer. Then there is a section which explains the Object Pascal language. The final chunk is taken up by descriptions of how to create a number of sample applications. These include a text editor, a file manager example, graphics, DDE and OLE. Three further manuals were included in the release of Delphi I was looking at. These are *Building Database Applications with Delphi*, *Component Writers Guide* and *Database Desktop Guide*.

Online help is fully context sensitive. There is an online reference to Object Pascal the component library. Also included is the Windows 3.1 reference manual. A rather novel feature of Delphi is its Interactive Tutor which guides the novice developer through various live demonstrations illustrating some of the programming techniques used in the product. These are what I would call 'run once' applications. They are fine when Delphi is loaded for the first time, where a hands-on guided tour will help get you started in the shortest possible time. But they lose their usefulness all too quickly. Figure 5 is a screenshot of an Interactive Tutor in mid stream.

Two ways to go

Borland is planning two versions of the product. The Desktop Edition provides out

of the box access to Paradox and dBASE and includes all of the features discussed so far. The Client/Server Edition provides SQL links to Oracle, Sybase, Informix and Interbase. A local version of Interbase 4.0 is included with the product which will run under Windows 3.1. ReportSmith Client/Server Edition and Visual Query Builder are also included. And there is team development support which gives direct access to PVCS 5.1 from the Delphi IDE.

For the future

At the time of writing Guy Martin, European marketing manager for development tools at Borland, said the first versions of Delphi Desktop and Delphi Enterprise will be available this month. The price of the desktop edition will be comparable to Visual Basic Professional.

Already Borland is talking about the next release. It will be able to generate 32-bit applications and will transparently recompile existing 16-bit code. Features that are noticeably missing from the first release such as support for OCX and OLE 2.0 will be available. Borland will also provide a repository for storing all components known to Delphi.

Delphi or bust

So there are two versions. At the low end, Borland is clearly competing with Visual Basic. And if this pre release is anything to go by, Microsoft had better start worrying. Visual Basic 4.0 was due this month but has been pushed back to when Windows 95 is launched. Even with the new user interface, the attraction of compiled over interpreted is likely to lure many devoted Visual Basic developers. At the entry level market, I believe that all Borland has to do is get the product out as soon as possible to captivate a deluded Visual Basic marketplace.

At the high end, Borland must prove itself. Here it is competing with Powersoft and Gupta. Being an unproved technology the company will have to work extremely hard to convince developers in this market to abandon their existing RAD tools for Delphi. For the last year the company has been extremely vulnerable. Weak financial results coupled with continual erosion of market share and the sale of Quattro Pro to Novell are all the wrong signals. It may have a technically superb product, but Borland desperately needs to lose its old image and present itself as a strong, stable software company. Perhaps, then, corporate developers will bet their future on Borland tools. Still, there is hope. The merger of Powersoft with Sybase could open the door for a new, independent Client/Server tool to supplant PowerBuilder.

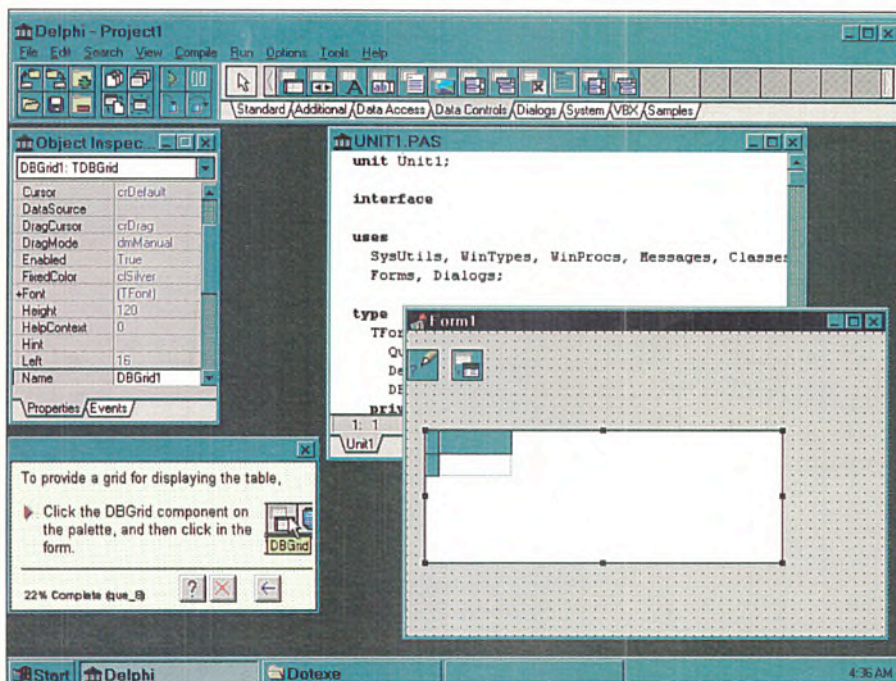


Figure 5 - Interactive tutors tend to lose their usefulness quickly

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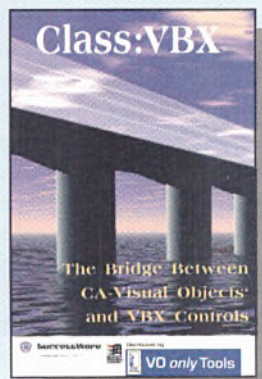
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Catching

With Visual Objects as the hound, CA hopes to take a bite out of the Windows database tools market before the next release of FoxPro. But is it the 'killer' database tool we have all been waiting for. Colin Hume believes it may well be...

For the first time Computer Associates has a product with the potential to become a major contender in the Windows xBASE market. Visual Objects 1.0 (VO). The genesis of VO was a Clipper for Windows project by Nantucket but the product has moved on considerably since then. This has included the incorporation of the CommonView class library when Glockenspiel was absorbed into CA. VO has recently completed an extensive prerelease programme. The priority for CA must now be to establish VO in the market place.

The Windows xBASE market does not have a dominant leader as yet, although the most immediate opposition to VO is likely to come from products such as dBASE for Windows and FoxPro for Windows. FoxPro was the first major xBASE product on the Windows market. It is close to the DOS product, easing migration but lacking in the capabilities of a true Windows development tool. However, the availability of Mac and Unix versions gives FoxPro a claim to be the first multiplatform xBASE development tool.

Standing alone

The origins of xBASE as an interpreter are well known; as is the fact that none of the xBASE compilers produces a native code (.EXE) but a form of p-code which requires

a runtime module to run an application. This, incidentally, is why the minimum size of a DOS Clipper executable is around 150 KB. It is one of the legacies of DOS xBASE, which in the case of both dBASE and FoxPro, has extended into Windows. FoxPro for Windows does not produce a standalone executable either, requiring instead a 2 MB runtime module. Borland has recently released dBASE for Windows which has better user interface design facilities than FoxPro but is still similar otherwise to classic DOS xBASE. Again there is no standalone EXE file.

However, this is not the case with VO, which is a true native code compiler. At source code level it requires a completely different approach to traditional xBASE. For example VO works best with strongly typed variables, but will allow loosely typed variables at the expense of performance. Another performance factor with VO is that the **LOCAL** and **STATIC** variables familiar to DOS Clipper developers should be used instead of **PRIVATE** and **PUBLIC**.

Death to legacy

Like FoxPro, CA has opted to break the visual design of a database application into discrete elements such as windows and the menus. A visual designer or editor is provided for each of these elements. The visual tools in VO include database and window editors, and class, error and module browsers. VO offers a consistent user interface in each of the editors and browsers. In many instances it also offer an auto or custom option, as in relation to creating menus. Once use of an editor is complete VO generates the required code. Subsequently it can build and compile the whole application. This includes producing a standalone Windows executable, adding a default icon and setting up a separate program group.

Computer Associates (CA) has taken a radically different approach with Visual Objects from that followed by Borland and Microsoft. VO bears no resemblance to the DOS Clipper product. It is intended to be used as an application generator with little or no hand coding. The longstanding issues surrounding application generators, particularly productivity versus flexibility, apply equally to VO to some extent. While the emphasis in VO is on 'codeless' visual pro-

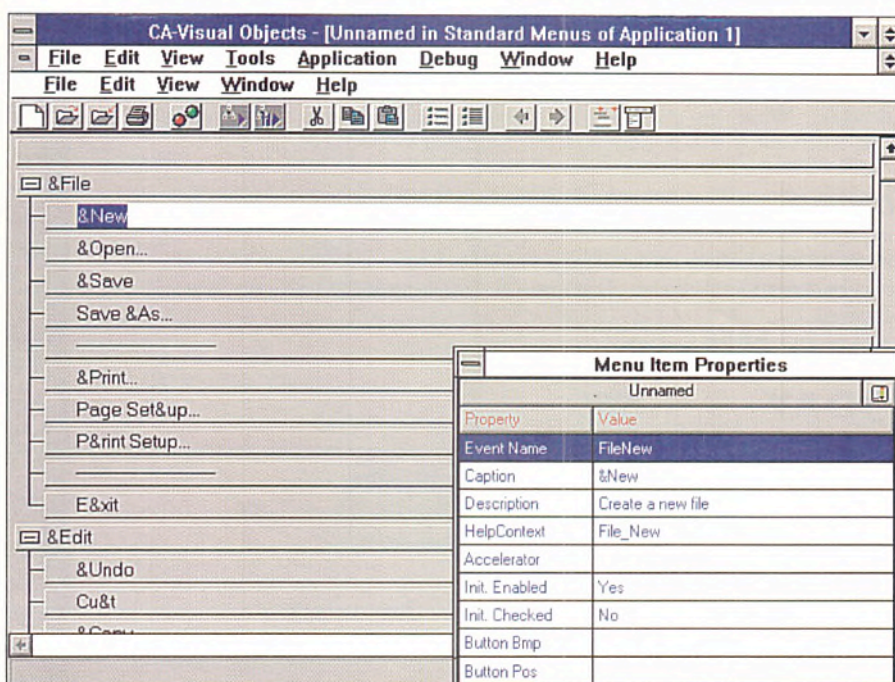


Figure 1 - Selecting properties in menu editor

the fox

gramming, there is a competent source code editor featuring colour code text and collapse/expansion of entities. Entities can include functions, classes and methods.

VO is fully object oriented, enabling classes and methods to be created. All the expected features of OOP are present such as encapsulation, inheritance and polymorphism. The OOP features in VO extend only to the user interface and the underlying data handling processes; it's an OOP front end to a traditional relational DBMS, not a completely OOP database. VO can be used solely at the visual tools level, without the developer needing to write any source code or become involved with OOP. Developers could use VO in this mode to start with, allowing the prospect of getting to grips with its more complex elements over an extended timescale.

Throwing out DOS

One of the weaknesses of Clipper in relation to other xBASE DOS products is the absence of the user interface command and function set found either in dBASE or more particularly, FoxPro. CA markets a dBASE IV add on for Clipper but this has been a very low selling product. In practice, most Clipper developers either write their own user interface, typically relying on a DO WHILE loop and INKEY(), or use one of the many third party products available.

This was not the case with FoxPro, which implemented a Windows style user interface, with buttons, dialog boxes and menus under DOS. Designing a user interface in Fox involves a collection of graphic design tools. This works well in DOS but is less satisfactory in Windows. All too often developers resort to hand coding, with all the maintenance and time frame implications that involves. Essentially, FoxPro stretches the DOS interface elements of xBASE to and beyond their limits. It is for this reason that the next release of Fox for Windows, Visual FoxPro or FoxPro 3.0, will be fully object oriented.

What Microsoft is doing with Fox is throwing off the xBASE legacy in easy stages. With VO, CA is hoping to throw off the legacy in one move. As a consequence, developing with VO is quite different to application development with the Clipper DOS product, although at source code level VO

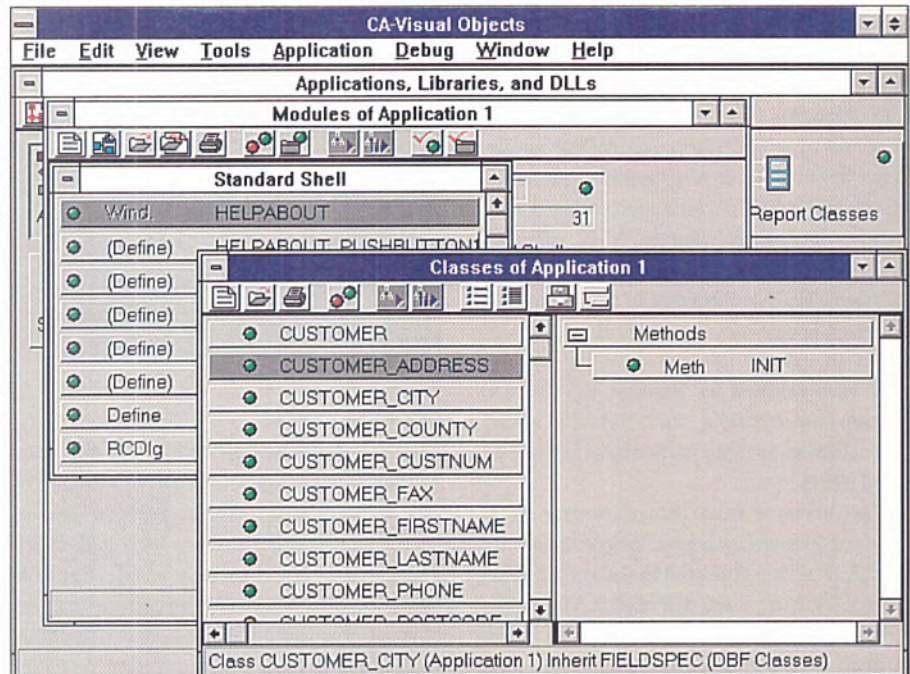


Figure 2 - The object model: classes can inherit fields

does offer significant compatibility with the Clipper 5.x flavour of the xBASE language.

VO may well offer the database developer the most complete Windows development environment available in xBASE, right down to an icon editor. What VO does not offer is the apparently easier transition from DOS of dBASE or FoxPro. This may well cause problems in terms of marketplace acceptance. Consider what happened to Borland's Paradox for Windows which, at the time, represented a similarly radical departure from its DOS counterpart.

The issue with VO is whether the steeper learning curve, in part because of the need to get to grips with OOP, really has a payoff in productivity terms both initially and with the maintenance involved in a substantial database application. If developers are able to use VO to develop applications using only the visual tools, then the potential productivity gains look substantial. On the other hand, real world database applications can involve complex aspects beyond the scope of application generation tools. So developers may find that any of the productivity gains they achieved through automatic application generation will be lost or drastically reduced when they begin 'fine tuning'.

At least in this respect, CA has been con-

siderate to the software developer's needs. The manuals shipped with VO are comprehensive, cover issues such as moving from DOS to Windows in depth, are well illustrated and have a decent index.

Standard bearer

Developing a first application with VO is trivial, taking a matter of minutes to create a simple database application. This involves moving through a series of dialogs allowing options such as a choice of DBF or SQL classes. The end result is an application that carries out mundane database functions such as moving through the data and selecting form or browse view. But the 'standard' application, to use CA's terminology, is not really very usable. Its significance is that it provides a framework which the developer can extend using VO's visual tools. It is also quite a powerful demonstration of what VO can do at a purely visual tools level.

Know your data

The first extension to the standard application is likely to be a data server. VO data servers provide an object oriented interface for either SQL or xBASE databases. Data servers are created and modified with one of the VO editors. For xBASE data this is

the DB server editor. The data server editor allows direct access to the properties of a server object, such as the **Shared** property which allows a DBF to be opened in shared or exclusive mode. VO automatically handles the file and record locking required for multi user applications. This is an improvement over DOS Clipper where file and record locking has to be explicitly programmed by the developer.

The servers allow new indexes to be created or existing indexes to be associated with databases. The order can be set, either in terms of specifying a controlling single index file or the tag of a multiple-index file. All the major xBASE index formats are supported, including Clipper NTX, dBASE MDX and FoxPro CDX. VO uses the same, excellent, RDD technology to do this as the current Clipper 5.2x for DOS. However CA needs to extend this list. I would like to have seen support for Paradox 3.5 and 4.x formats for example, and possibly some non-database formats particularly Lotus 1-2-3 and Excel.

The absence of a data dictionary as a standard feature has been a long-term flaw in xBASE. The first appeared in CA's other Windows xBASE product, dBFast 2.0. VO implements a data dictionary at server level through field specs. These contain not only the usual properties of a field such as name, type and length to be specified but also a caption, description, picture, range and validation rule. Messages, for when ranges are exceeded or when validation rule errors occur, can also be specified. There is a separate field spec editor in VO, which allows the fields to be added, deleted or their properties modified at any stage. As always this needs to be done with caution if live data is involved.

The VO server is a major innovation for xBASE. More particularly it removes the responsibility which xBASE otherwise places on the developer for ensuring that DBFs are opened in the same mode, with the correct index files, a consistent alias, correct field pictures and valid clauses throughout an application. For developers the VO server offers important advantages not only for new applications, but also in eliminating the constant risk with xBASE of inconsistencies arising from maintenance.

Time for a dialog

A welcome feature of VO are the data windows. These are linked to the data server and display data by referencing the field specs properties of the server object. They are created in the windows editor. There are two options available for creating a data window, either the quick, automatic layout or a slower, customised layout. The data window includes alternate form and browse

views as standard, a preferred option nowadays for most end-users. It is possible to set one or other as the sole view if preferred.

Data windows can include sub-windows, which can be edited in the same way as the main window. This allows, for example, the possibility of adding a browse view sub-window to a form view window, again a popular feature of current applications. VO browse views allow the order of the columns to be adjusted by dragging them with a mouse.

With VO, CA is hoping to throw off the xBASE legacy in one move

Creating menus

The VO standard application and the data windows make significant use of sets of picture buttons and toolbars. Buttons can be more popular than menus with end users because they are constantly visible. For new users the significance of the pictures can be obscure. For them balloon-help is useful but does not feature in VO. In practice, developers need to balance how much of the user interface is presented through buttons and how much through menus.

Creating menus in VO involves using, surprise, surprise, the menu editor. You can also create and edit toolbars with this. Extending another theme throughout VO menus or toolbars are defined or edited by altering their properties. Editor options include the ability to display buttons as text, icon, or text and icon. Floating toolbars can be specified.

The downside

VO has some weaknesses, notably the absence of query optimisation a la Fox's Rushmore and OLE 2.0, but both of these could and should be put right by CA in subsequent releases. Another minus point regards the reporting facility. Report editing in VO does not involve one of the standard editors but a version of CA-RET, Computer Associate's own Windows report writing utility. While CA-RET is a capable product, it involves a significantly different user-interface which breaks up the integrated feel of VO. This is a point CA needs to give some early attention to.

Unlike FoxPro, VO cannot claim to be a multi-platform product. There are too many differences between VO and Clipper for DOS, and there are no known plans for a Mac version. However, one clear advantage

of VO over dBASE for Windows and FoxPro is the size of the EXE it produces; around 240 KB for a minimal standalone application. This is well below the size of its competitors and a reflection that VO is a true native code compiler.

Conclusions

Visual Objects certainly appears to be a complex and powerful Windows database application development tool. Many Clipper developers, particularly those with little or no previous experience of developing under Windows, may initially find the radically different approach that developing with VO involves initially somewhat frightening. This would explain the lukewarm response to VO amongst such developers, of which the low level of activity in the VO section of the Clipper conference on CIX provides some evidence. This response may diminish as experience and confidence in VO continues to build. What is clear from my grasp of the product is that the visual editors, for example, offer a major advantage over competing Windows xBASE products such as dBASE and FoxPro.

VO is of course aimed at a wider target audience than Clipper developers and certainly deserves serious consideration, even in its first release form, by all Windows xBASE developers. That CA is correct in implementing OOP as the way forward in Windows xBASE development is borne out by Microsoft's move into OOP with Visual FoxPro. While Visual Fox is in beta at present it remains to be seen how complete an implementation of OOP it will contain. CA certainly needs to make the most of the first release of VO before Visual Fox reaches the market.

The issue facing CA is that VO is one of those products which really needs to be used to be appreciated. And to do that it needs as wide an initial market as can be obtained. That will not be helped by CA's pricing strategy, which involves an initial recommended retail price of £700 plus. This price looks reasonable in relation to other heavyweight database development products such as PowerBuilder, but not in comparison with say a Borland C++ and database tools combination, or dBASE for Windows or FoxPro for Windows. To attain the equivalent of the position that Clipper achieved in the DOS xBASE market CA needs to reposition VO at a significantly lower level in price terms. A better level would be around say £300. There is a risk otherwise that an overpriced VO will only command a niche position in the market. ■

CA is on 0753 577733. The cost of Visual Objects is £695. Colin Hume can be reached on email as chume@cix.compulink.co.uk.

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Beyond a browse

There is more to the Web than just browsing it. **Chris Cant** explains how to build interactive Web forms as executable URLs. This month with DOS...



Back in the mists of July 1994, Paul Richardson may have started you Walking the Web. I will now take a step further. In this article I will focus on World Wide Web forms and how to write PC executables which work with the NCSA `httpd` web server, using the Common Gateway Interface (CGI). Suppose, for example, that you have put up some information on the Web and now want feedback on your pages from the lucky recipients out there in WebLand. This is what Pizza Hut is doing in the US with its experiment in which you can order direct from the Web.

Running a business from the Web brings up other considerations. For instance, should you ask for credit card details on your forms? The jury is still out on this. However, although internet traffic can obviously be intercepted, so too can, for example, telephone calls.

Is there anybody out there?

If you want feedback, of any kind, on the information you post up on the Web then you need forms. These are supported by most browsers and servers. As can be seen in

Figure 1 you can have fill-in text fields, list boxes, radio buttons and check-boxes. There's always a push-button to submit the form for processing. But before we let our imaginations run awry with the potential of our own web form we had best get up to speed on Hyper Text Mark-up Language. Remember that this is the method used to write pages for the Web. HTML is plain ASCII text, but marked-up with tags in angle-brackets. Local browser software will receive HTML (and other types of information) and show it on the display in the way that we have set it up, for example using the fonts that we want.

Remember also that URL stands for *Universal Resource Locator*. For the most part, we will be talking here about URLs that refer to HTML pages or PC executable URLs that return HTML pages.

Figure 2 shows the HTML for the form in Figure 1. It must be said, here and now, that forms are not the be-all and end-all of user interface design. In HTML there is no way to specify that a field is an integer or date, or even that it should not be empty. Worse, if our eventual executable detects an empty field and returns a suitable message, then when we get back to Windows Mosaic it will have sagely decided to clear the form of any user input. There is a dubious technique to get round this problem, described later. So, normally the user has to get it right in one fell swoop. Mosaic also does not allow tabbing between fields, short-cuts, and other Windows niceties. On my screen, check boxes and radio buttons do not look too good. Having said this, Web forms do provide a way of getting simple information from the rest of the world from whatever computer is being run.

Jolly good form

Building a form is relatively easy. We can set up named fields with default values. Once the form is filled in the results are sent (by one of two methods) to our program as

```
fieldname=value
```

If a field name is repeated then it can be sent twice. Blank text fields have

```
fieldname=
```

sent. For check boxes, if the box is selected then the default value is sent; otherwise

EXE Form Demo

Welcome to PHD's demo of a World Wide Web HTML form for EXE

Chip Shop Order

Please enter your order for the chip shop:

Choose a meal: Fish and Chips Haggis and Chips Veggie kebab and Chips

Choose your condiment: ☐ Salt ☐ Vinegar ☐ Brown Sauce

How are you going to pay: ☐ Cash ☐ Cheque ☒ In kind

Enter your name:

Enter your phone number:

Enter your address:

Delivery within the week.

Contact **Chris Cant, PHD Computer Consultants Ltd** <cant_c@nsa.bt.cc>

Figure 1 - An example form viewed in Mosaic

even `fieldname=` is omitted. We can implement group radio buttons by giving them the same name, but different values. The browser handles the rest.

For each form, an `ACTION` parameter to the tag specifies which URL should be run to process the results. We will normally want to have an executable to cope with the results of our form. However, at this stage it is worth noting that we can specify a PC executable as a URL. When the user requests such a URL (or links to it) and the program is run, output is sent back to the browser for viewing. This output is normally HTML, but we can send back any MIME type that the browser will accept.

Reading demons

For forms to be of use we must be able to publish our Web pages and write a program to receive the form results. For PC Windows 3.1, this currently means running NCSA's `httpd` (hyper-text transfer protocol daemon), available at `ftp.ncsa.uiuc.edu` in directory `/Web/ncsa_httpd/contrib/pub/pc/win3/winsock/`. The equivalent for NT, HTTPS, is available at `emwac.ed.ac.uk` in `/pub/https/`. However I have not checked whether the CGI executable format works in NT. On a 486DX/66 with 8 MB RAM approximately 8 requests per second can be handled by `httpd`.

`httpd` is highly configurable. We can set up the IP port and basic directory tree that is visible, along with aliases to other parts of the file system. If a directory's index file is not available `httpd` can automatically generate attractive directory listings as an HTML page. There is fairly comprehensive access control, with users and groups of users allowed access to the whole service, or on a by-directory basis. There is also logging of errors and accesses. `httpd` picks up the list of MIME types that it can serve to the world. And yes, that's the same MIME as used by the mail system to send messages of different types, eg text, audio, etc. (HTML is one of these MIME types).

To be of any use, your PC must have a permanent connection to the world. If you use a dial-up service then you cannot have people dialling you back in. Some service providers allow you to put up pages on their host, possibly charging for the service. That said, you can reference `httpd` running on your own PC to do the testing. However you could set up a free-standing system on your local network. Even a serial link between two PCs will do. Having a good server and browser could almost make it worthwhile setting up TCP/IP on your network just for local information dissemination and collection. Alternatively, you could publish your

```
<HTML>
<! .EXE DEMO INDEX.HTM, PHD Computer Consultants Ltd>
<HEAD>
<TITLE>.EXE Form Demo</TITLE>
</HEAD>
<BODY>

<H1>.EXE Form Demo</H1>
<B>Welcome to PHD's demo of a World Wide Web HTML form for
.EXE</B><P>
<HR>
<FORM ACTION=/phd-wcgi/wincgi.exe/Chips METHOD=POST>
<H1>Chip Shop Order</H1>

<I>Please enter your order for the chip shop:</I><P>

Choose a meal:
<SELECT NAME=meal SIZE=3>
<OPTION> Fish and Chips
<OPTION> Haggis and Chips
<OPTION> Veggie kebab and Chips
<OPTION> Chips only
</SELECT><P>

Choose your condiment:
<INPUT TYPE=CHECKBOX NAME=Condiment VALUE=Salt> Salt
<INPUT TYPE=CHECKBOX NAME=Condiment VALUE=Vinegar> Vinegar
<INPUT TYPE=CHECKBOX NAME=Condiment VALUE="Brown Sauce"> Brown
Sauce
<P>

How are you going to pay:
<INPUT TYPE=RADIO NAME=PayMethod VALUE=Cash> Cash
<INPUT TYPE=RADIO NAME=PayMethod VALUE=Cheque> Cheque
<INPUT TYPE=RADIO NAME=PayMethod VALUE=Kind> In kind
<P>

Enter your name: <INPUT TYPE=text NAME=Name SIZE=40><P>
Enter your phone number: <INPUT TYPE=text NAME=PhoneNo
SIZE=30><P>
Enter your address:
<TEXTAREA NAME=address ROWS=3 COLS=40> </TEXTAREA><P>
<INPUT TYPE=submit VALUE="Order chips"><P>
</FORM>

Delivery within the week.
<HR>

Contact <B>Chris Cant, PHD Computer Consultants Ltd
</B><I>&lt;cant_c@nsa.bt.co.uk&gt; </I>
</BODY>
</HTML>
```

Figure 2 - HTML used to create form

Web pages on a Sun, but run a PC executable on a separate PC running `httpd`.

Get the post

There are two methods of reporting form results. The older form is GET, where the results are appended to the action URL after a question mark. This is known as a query.

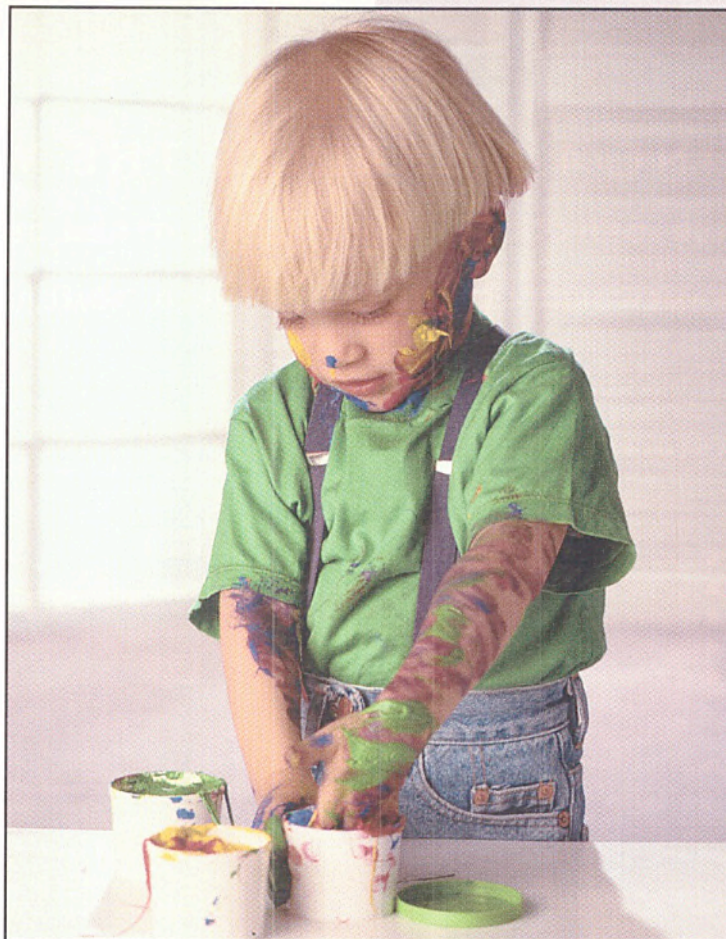
So if you have one field, `Name`, which has 'Chris' in it, and another `Sex` with 'Male', then

?Name=Chris&Sex=Male

is appended to the URL, where `=` and `&` are the other crucial delimiting characters.

To make sure that the query gets through, we have to encode some charac-

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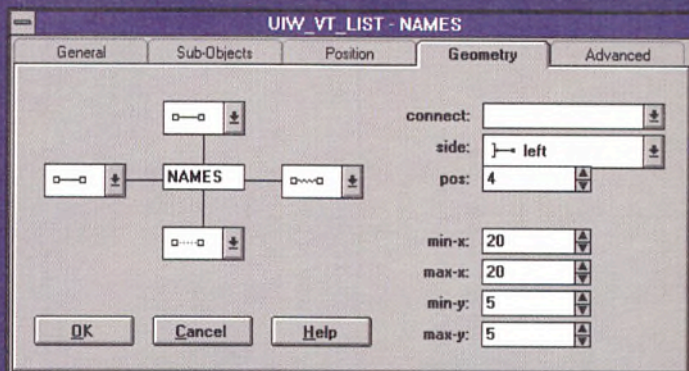
- STRING
- FORMATTED STRING
- DATE
- TIME
- NUMBER
- BUTTON
- RADIO BUTTON
- CHECK BOX
- VERTICAL LIST
- HORIZONTAL LIST
- COMBO BOX
- NOTEBOOK
- TABLE
- PULL DOWN MENU
- POP UP MENU
- TOOL BAR
- STATUS BAR
- SPINNER
- SLIDER
- SCROLL BAR
- ICON

PROMPT

- GROUP BOX
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ters so that they are not lost. For example, spaces are turned into '+' signs. Other characters are encoded in hex so that an ampersand in a field is encoded as the three characters '%26'. Other wacky characters, including the pound sign, are encoded as their Windows ANSI character set value. Although the user will see this encoding in the URL that your browser shows, the server usually does the decoding before presenting the information to your program.

As you can imagine, a URL can become pretty big with this method. I recommend that you use POST. This sends the data separately from the URL although it is encoded in the same way. We'll see how to pick up the information later.

PC Executable URLs

The URL that is run when a form is completed has the same job as the URL for returning results to the form. It must provide a response to the browser, except the program has some extra input informing you of what the user said.

We can add parameters, even to ordinary references to executables as URLs. If we have an executable URL of

```
http://www.exe/dynamic.exe
```

we can pass it sub-directories and queries. Sub-directories are obvious. We just say

```
/www.exe/dynamic.exe/option1
```

and our program will receive '/option1' as its **Logical Path** parameter. Queries, as noted above, comprise a question mark followed by any parameter(s), which must be encoded as described above. For example

```
/www.exe/dynamic.exe?pound+sign=%A3
```

Our program will receive a query both as a command line argument and as its **Query String** parameter.

Together, these provide two different methods of passing parameters to a program. This is a useful technique when one program is reused. We can tell where it is called from by seeing which parameters have been passed. For forms, I would suggest only using sub-directories in the ACTION URL. This is partly because queries can be used for GET results, but mainly because the image map support, described below, always returns its results using a query string.

DOS Executables

The first type of executable is a DOS program, run in a DOS box by **httpd** from Windows. The documentation only refers to running batch files with the DOS **COMMAND.COM** processor but you can run ordinary executables as well.

```
/*-----
DOSCGI.CPP
(C) 1994 PHD Computer Consultants Ltd
1 October 1994: Chris Cant
-----*/

#include <stdio.h>
#include <stdlib.h>

main( int argc, char** argv)
{
    char* OFname = getenv( "OUTPUT_FILE");

    FILE* hOF = fopen( OFname, "w");
    if( hOF==NULL) return 0;

    fprintf( hOF, "Content-type: text/html\n\n\
Sample DOS CGI Program/title\n\
h1Sample DOS CGI Program/h1\n\
The following data was received:HR\n");

    fprintf( hOF, "argc = %d.\n", argc);
    for( int arg=1; arg<argc; arg++)
        fprintf( hOF, "arg[%d] = %s.\n", arg, argv[arg]);

    char* CFname = getenv( "CONTENT_FILE");
    fprintf( hOF, "HRH2Content file is %s/H2\n", CFname);
/*
FILE* hCF = fopen( CFname, "r");
for(;;)
{
    char buf[80];
    if( fgets( buf, 80, hCF)==NULL) break;
    fprintf( hOF, "%s", buf);
}
fclose( hCF);
*/
fclose( hOF);

    return 0;
}
```

Figure 3 - The simplest working DOS CGI program

httpd writes a temporary batch file which sets various environment variables and then calls our DOS executable or batch file. If our form uses the GET method of transferring information, then the whole of the encoded query (eg **Name=Chris&Sex=Male&Pound=Sign+%A3**) is passed as the first argument to our program. Alternatively, if we are using the POST method then the same information is placed in a temporary file and we are passed its path in the **CONTENT_FILE** environment variable. However I found that I got a sharing exception when I tried to read this file. But the code in Figure 3 is a DOS C++ program which *does* work, although I have had to comment out the part which references the

content file, for the above reason.

The program was compiled with the Zortech C++ 3.1 compiler, but I am sure any other C++ (or C) compiler will work fine. The output is written to the file whose path is in the **OUTPUT_FILE** environment variable.

Windows to come

In the next issue I will discuss the Windows Executable version, which, incidentally, decodes the form information itself. I will also explain the required format for the **OUTPUT_FILE** output file.

Chris Cant can be reached by email as cant_c@nsagw.nsa.bt.co.uk.

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- New version 4.5 of Borland C++ has support for OLE apps via OCF, VBX support in 32-bit apps and hosted on Win, Win NT and Windows 95.
- Microsoft Visual C++ 2.0 now shipping, with option of special offer Windows NT Workstation version 3.5.
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EXE Compiler report -Part III

Watcom C/C++ 10.0  features in this third instalment of the EXE C++ compiler report by Rhea Laboratories.

With the best of intentions I did promise last month that this would be the final part of the report. But my best intentions seem to have gone astray. So this month I will tackle Watcom's latest offering. And I won't make any bold promises for next month.

The Watcom C/C++ 10.0 compiler is the first from the company to provide a Windows-hosted IDE. Watcom certainly promises the sun, moon and stars on the box! In a single product you get a compilation system hosted under DOS, Windows 3.x, Windows NT or OS/2 v 2.x, capable of generating code for 16-bit DOS, 32-bit DOS, 16-bit OS/2 1.x, 32-bit OS/2 2.x, 16-bit Windows 3.x, 32-bit Win32s, Windows NT, Novell NLMs and AutoCad ADS/ADI. No other product supplied to us offered such a complete range of development environments and support.

Since shipping this version to us, Watcom has also released a 10.0a patch set. However the patch was not made available in time for the review.

Apparently ANSI

The C++ language implementation supports both templates and exceptions. It appears to be based upon the draft ANSI standard. I say 'appears' because Watcom does not provide a language reference manual among the otherwise fairly comprehensive online documentation. Watcom has included several Microsoft-compatible language extensions to support the Intel 80x86 segmented architecture. These include: `__near`, `__far`, `__huge`, `__based`, `__segname`, `__self`, `__segment`.

It has also added some language extensions to support low-level code development. These include `__interrupt` routines and inline assembly facilities. The `__export` modifier is a language extension that explicitly exports the object being defined from a DLL. It reduces the role of the module definition file. Furthermore, the compiler can automatically determine the type of function prologs needed for functions defined as `__export`. Although Watcom does support multiple threading for NT

and OS/2, I could find no equivalent of Microsoft's `__declspec(thread)` declaration modifier to allow the use of static variables created on a per-thread basis.

IDE a drag

The Watcom system is simple, basic and undemanding. The IDE is a standard Windows MDI application. It allows only one project to be open at any time, but does allow a project to contain multiple targets which may be of different types. So it's easier to develop and track a product development which contains a couple of EXEs and two or three support DLLs.

The source file editor is another standard MDI application. It is perhaps a little primitive when compared to MSVC 2.0, and quite frankly looks dated compared to the newest products such as the forthcoming Symantec C/C++ 7.0. The only browsing facility here is `fgrep`, which is of limited use if all source files are not in the same directory. The syntax colouring is set through an on-screen palette by dragging a colour to a syntax element. All elements of that type get recoloured. Of course, to do it properly, you need an artificial source example guaranteed to have one of every type of syntax element on-screen at once; I hadn't, so I ended up scrolling up and down a source file to get what I wanted. Frankly it felt a little gimmicky. I could hear a designer saying 'let's put some drag & drop in here somewhere.'

The tool bar is fixed at the top of the screen and cannot be moved or customised. When you double-click any file shown in a project target window, the corresponding editor (source editor, dialog editor etc) is launched showing the file selected.

Watcom provides a separate graphical source/class browser and it's rather neat. But like so many of these tools, it depends on a database that is only created after a largely successful project build. And while you can access the source editor from within the browser, I found no automatic way of accessing the browser from the IDE or source editor.

The graphics image (bitmap) editor is

What really sets Watcom above the rest is that its debugger can 'undo' the effect of instructions

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straightforward and easy to use. Unfortunately it has an annoying cosmetic in the size/placement of captions that gives it a vaguely 'hurried' feel. Double-clicking a resource file brings up the standard source editor showing the .RC source. This is surprising, since there is a reasonable resource editor included, but that must be run from a menu option or directly from the program manager. It gives the product a 'bitty' feel, more like a collection of tools than a properly integrated Windows or NT development suite.

The dialog editor is again, rather basic. I still haven't found a way of making the snapping grid work. The dialog box is stuck at a grid granularity of one by one and won't accept any changes. And there are no alignment shortcuts such as 'make the left edge of this button align with the left edge of this one'. Another problem I encountered was lack of sensible defaults. For instance a button can be resized from a single point upwards. But there is no 'default' size from which it starts. What this means is that all cosmetics have to be done by eye, with the mouse, and a very careful eye on the coordinate display. It works, but I wouldn't want to develop a lot of user interface stuff with it. Frankly, it explains a lot about the slightly 'off' presentation of the installation program.

Thread of evidence

The standard C library routines seem to contain most of the common MS extensions for BIOS and DOS manipulation. The compiler includes a set of class libraries, including the standard C++ `iostream` handlers, a set of Container exception classes, a set of Container classes (Hash, List, Queue, Skip List, Stack and Vector) and a String class.

It also includes the Microsoft MFC classes; the 16-bit version is MFC 2.5, but the 32-bit classes are only at MFC version 2.1. Watcom has not (as yet) updated to MFC 3.0 for the 32-bit NT developers, which makes developing multi-threaded MFC applications difficult if not impossible. I suspect that MFC 3.0 may require the use of `__declspec(thread)` variables for its multi-thread support.

For the sake of DOS

Watcom does still have support for DOS-hosted development, unlike some of its competitors. It includes the misleadingly named vi editor and a DOS-hosted debugger. Of course these look primitive when compared to the Windows-hosted tools. Still, if you're doing serious DOS development, it's a lot better than nothing.

The Watcom vi editor is a fairly conventional DOS CUA-like editor, with all the expected block mark/move stuff, but of

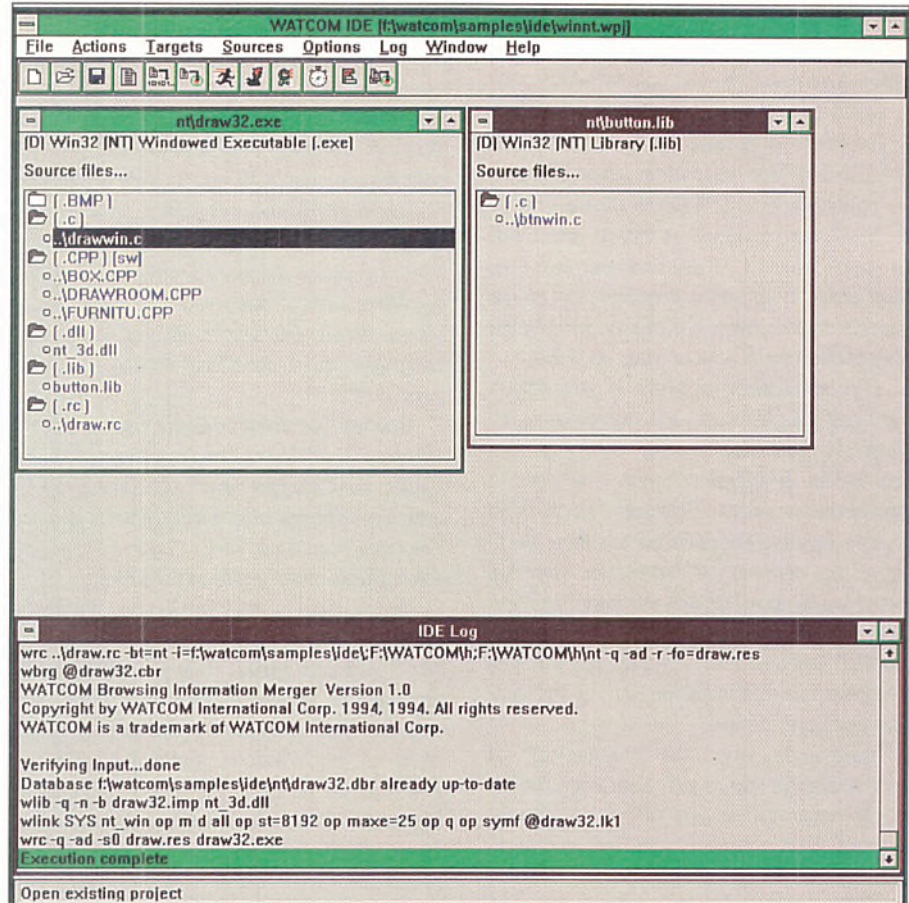


Figure 2 - Watcom's IDE is not the most modern...

course no pretties like syntax colouring, and no facilities for compiling or building from within the editor. You have to build your own makefile and compile/build from the DOS prompt like they used to do in the bad old days before sexy GUI IDEs. It's all a bit primitive by today's standards and you wouldn't really want to do the development process DOS-hosted.

Hell for bugs

With every product I've reviewed so far I have come across one brilliant feature that really shines. Watcom's is without doubt its Windows debugger. It really is kind of nice. Standard MDI, no fuss, not too many frills. Good solid facilities to view source and assembly, stack, variables and memory at an address. It can single step and step across functions, set breakpoints and watches and freeze and thaw threads. However there are no remote debugging facilities, either by serial link or network, which is surprising in a product of this level.

The features I have described, apart from, thread debugging, are all pretty much standard in debuggers. What really sets Watcom above the rest is that its debugger can 'undo' the effect of instructions. You can set a breakpoint at the point where you think something has gone wrong and step backwards watching the symptoms of the

bug 'undo' themselves. Step forwards, backwards and get a much clearer view of the development of the problem. The number of instructions you can 'undo' is limited by available memory. But in most applications it probably wouldn't need to be very large.

It can also note the current execution point and 'replay' execution from the start to that point (which may have been saved on disk from a previous day's debugging session). At last, someone has realised that some bugs are sufficiently complex that you can't get them fully debugged in a single session! And you can scan down the stack, looking at the point where the current routine was called from, see its local variables, and so on, all the way back down to `main/WinMain`.

The DOS-level debugger is written as a conventional DOS CUA-style application. It seems to be a close match to the facilities of the Windows debugger, (complete with roll-back etc) and looks quite well-behaved.

Megabytes...

The version supplied came on a CD-ROM, with all documentation except the *Getting Started* guide, which is also on CD. CD-ROM installation is *strongly* recommended. A floppy version is available, but I wouldn't want to use it. I estimate it is about 62 disks worth. The minimum system requirement is

an 80386 or higher processor, with at least 8 MB of RAM. But 16 MB or more of course is required for development under Windows NT.

A full installation of an NT development environment to develop for DOS, Windows and NT took 5 to 10 minutes, depending on the options selected. Watcom allows a range of installation options, as usual, from 'run most of it from CD-ROM' to a complete disk installation. Disk space required can range from 15 MB to over 170 MB depending on what options you install on your hard disk.

The installation program is straightforward and simple to use, but vaguely unsatisfying. If you don't want the compiler installed in its default location, you have to type in the new drive/directory. There is no browse facility. There is no advance warning of the amount of disk space your selected installation options are going to need either. And some of the dialogs have a 'rushed' feel to them, with text entry boxes cramped unnecessarily on top of the buttons just underneath.

Annoyingly, when the copying part of the installation was mostly complete, the so-called 'progress bar' just sat on the screen, showing 100% complete, with the only available control being a Cancel button, which I was reluctant to press.

Documentation

The online documentation is detailed and comprehensive, apart from the earlier-mentioned lack of a language reference manual. Watcom will supply (at a price) full printed reference manuals. These include a *Watcom C Language* manual and Bjarne Stroustrup's book, *The C++ Programming Language*. Well, I suppose it's more honest than watching other authors desperately trying to paraphrase Stroustrup's work without infringing copyright, but I can't help feeling cheated, somehow...

Printed documentation includes a *User's Guide*, a *Tools User's Guide*, a *Programmer's Guide*, the *Debugger User's Guide* and the C and C++ library references. There is also the *Graphical Tools User's Guide*, a *Programmer's Guide* and a guide to the linker.

Online help is available for the Windows API, the Win32 API MFC 2.1 library and MFC technical notes. Help for all the tools and utilities is also available. Actually, the manuals and help files seem pretty good. Most of the Windows and MFC stuff appears to be straight Microsoft relicenced. My one criticism here is that although the *User's Guide*, *Programmer's Guide*, *Linker Guide* and *Tools Guide* seem to cover the ground adequately it is with an absolute minimum of diagrams. The IDE help file is

rather better, with reasonable screen captures for the most important things. But I felt that in the absence of printed documentation, it could usefully have gone even further.

Conclusion

Watcom C++ really has a good feel to it, if a little clunky in places, with a slight feel of a kit of tools bolted together rather than having been redesigned 'from the ground up' as an integrated development environment. There is reasonable power but it is not the most modern-looking product on the market. There have been some apparent slips in the design of the integration making it a little uncomfortable, but with few apparent real problems, and one outstanding virtue, the debugger.

If you're wanting to develop cross-platform in a serious way, or if you still want to develop large DOS applications, it's well worth a close look. And if you're getting stuck on a really weird bug, consider it just for the debug rollback facilities.

This article is based on a special report commissioned by EXE magazine and produced by Rhea Laboratories. The full report is priced at £35 for the Technical version and £70 for the Management version. Ring Suzanne Chamberlain on 0171 2875000 for details.

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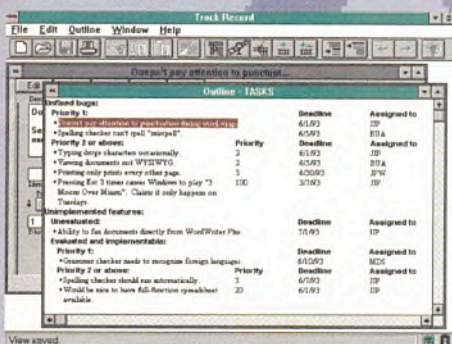
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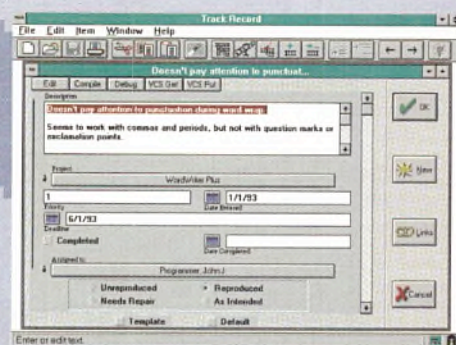
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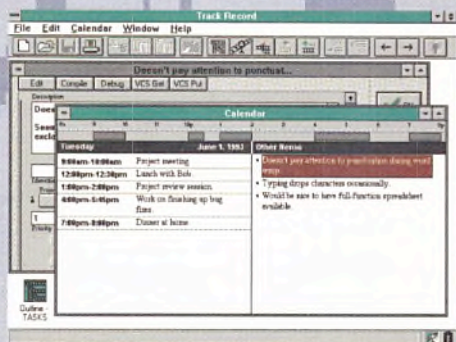
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Keywords, old and new

In its long history, C's vocabulary has been  enriched with new terms.

Some are keywords, some are reserved identifiers. **Francis Glassborow** explains how to avoid the pitfalls of this namespace pollution.

Keywords are the essential core of any computer language. They are the building blocks through which the entire language is constructed. Yet, during the 15 years of its existence, very few extra *keywords* have been added to the original very slim set in K&R. However, a large number of *reserved identifiers* have been added via the ISO C Standard Library. Also, many other identifiers have been reserved for future use.

Sorry, it's reserved.

The main issue of this month's column is the new keywords being introduced by C++. However, before I begin, I would like to cover briefly the issue of reserved identifiers. C separates its namespace into a number of disjoint sections and then provides a minimalist set of hiding rules. For example tag names (**struct**, **union** and **enum**) are distinct from other identifiers. This leads to a certain amount of reuse of names, normally to the profound confusion of all concerned. For example:

```
typedef struct example
{int example;
 example;
```

is enough to confuse anyone, yet I have seen similar pieces of code in print.

C++ unified most of the C namespaces and then added a more complicated set of hiding rules to handle some of the problems such as new user-defined typenames. Having ensured the maximum potential for namespace pollution it then had to intro-

duce a new mechanism. But that subject is a whole article in itself. The important point is the result that, in the context of C++, reserved identifiers will be much less invasive than they are in C.

C, and to a lesser extent C++, has a very invasive use of reserved identifiers which provide things that are not supplied by keywords but probably should be. That is, the language designers did not want to add them to the grammar of the language. The pre-processor is used to provide meanings for these non-keywords. Despite popular opinion to the contrary, such things as **size_t** and **wchar_t** can be provided by **#defines** in C, instead of **typedefs**.

Small is beautiful

C is very proud of how small a set of keywords it needed and does everything it can to keep the set small. Any proposal to introduce a new keyword immediately runs up against the cry 'It will break existing code.' Fortunately this has not been too serious a handicap to C. However, in the context of C++ it has been close to a disaster as it encouraged the overloading of keywords with context based meanings. **static** is probably the classic but other words have suffered. Perhaps more important is the damage caused by reluctance to consider new words to handle new facilities.

None-the-less, pressure has built up to introduce extra keywords and a considerable number of them have been added. All C++ programmers rapidly become familiar with the early introductions such as **class**, **new** and **delete**. It is worth noting that both **new** and **delete** suffered from the reluctance to introduce more than a minimal number of extra words to the language. Both are simultaneously keywords reserved words for user modifiable functions. The resulting confusion between **operator new** and the **new** operator will plague C++ programmers for generations to come.

I want to focus for the remainder of this column on keywords that have been introduced into C++ during the last couple of years. Not all have been implemented in

common compilers and some may even be changed again. So most should be avoided except for use in code compiled with a compiler that understands their meanings as keywords.

Fear of breaking the existing

C's habit of providing extensions to its type system via the preprocessor **#defines** or by **typedefs** is not adequate where overloaded functions or operators need to distinguish types. The outstanding example of this is **wchar_t**. In C++ this must be either a genuine built-in type or provided via a distinct built-in type which cannot be confused with any of the integral types. Currently **wchar_t** is a built-in type though there is a proposal that we should provide a new type **long char** and then use **typedef** to support its use as **wchar_t**. This is a small technical issue that need not concern us here.

True or false

The introduction of **bool** as a built-in type is likely to have repercussions on some existing code. Fear of these repercussions long delayed the decision to make **bool** a keyword but, very late, common sense won the day. Pulled in with this new keyword are **true** and **false**. There is still some argument about how these values should be printed as output. The easiest interim fix is to add

```
enum bool {false, true};
```

to your code. When your compiler is revised to accommodate the new keywords it will tell you, noisily. Deleting the **enum** should bring the code into line. No doubt some subtle points may still have to be tackled but I am currently unaware of any.

We mentioned **mutable** in an earlier column, but just a reminder: this type qualifier (the others are **const** and **volatile**) allows a data member of a class to be specified as changeable even in a **const** instance of the class.

Other type issues

Those of you using an up-to-date compiler may be aware of the new casting mecha-

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nism. Currently this requires four keywords: `const_cast`, `dynamic_cast`, `static_cast` and `reinterpret_cast`. None of these is likely to clash with identifiers in previous code though it would be nice to have a tool that would check legacy code for possible problems resulting from both these and other more dangerous new keywords.

The fifth keyword introduced with these was `typeid`. I think that will be the eventual spelling but I won't be too amazed if it gets changed to `type_id`. The purpose of this keyword is to allow an executable to check if the type of one object matches another. I almost wrote 'exact type', but there is an ongoing debate as to whether `const` and `volatile` (also `mutable`?) are part of a type or not. One point on the pro side is that `const` and `volatile` can be used for overload resolution (I think this is a serious flaw in C++). A side effect is that storing information about `const` and `volatile` qualification for runtime access would add serious complexity to an executable's code.

Resolving name clashes

The growing problem with clashes between identifiers in different libraries is being resolved, though there is still a lot of detail work to be completed, via the concept of namespace. To support this concept, the keywords `namespace` and `using` have been added to the language. A consequence of this work is that you should restrict the use of the global *scope operator* to places where it is essential. In the context of a namespace the global operator may have unwanted effects.

There will be a number of namespaces provided to handle the Standard Library and the consequential reserved words. This will continue the concept of encapsulation all the way to reserved words themselves.

Hot from the most recent WG21/X3J16 meeting is the introduction of the keyword `typename` to fix up a problem with parsing template classes where an ambiguity could exist as to whether a name was an identifier for a user defined type or for something else.

Salvation at last

The same meeting which agreed to introduce `typename` fixed the long standing problem that single parameter constructors also implicitly provide user defined type conversions from the type of the single parameter to the constructor type. Experts know that these are a self inflicted disease in any code. The problem is so bad that many have quite ugly hacks (some of them called 'elegant solutions') to avoid single parameter constructors.

Those of us who dislike hacks (ugly or otherwise) have recently increased the pressure to fix this problem. Many solutions have been proposed. Not breaking existing code ruled out most of them. It became clear that a new keyword would be the only reasonable route (though someone wanted to recycle the almost defunct `auto`). In the end it was decided that `explicit` could be safely introduced as a keyword without risking silent damage to existing code. It means that future parsers should treat any prior uses of `explicit` as errors which will have to be fixed. I'll provide more precise details when I have them.

Alternative spellings

Quite some time back, C++ decided to support alternative spelled out versions of a number of operators because some of them caused problems for some language specific keyboards (notably but not exclusively that used by the Danes). The following have been keywords of C++ for almost four years though many compilers still do not recognise them: `bitand`, `and`, `bitor`, `or`, `xor`, `compl`, `and_eq`, `or_eq`, `xor_eq`, `not`, and `not_eq`.

Personally I find code using these difficult to read and I would strongly advise programmers to avoid their use. Though some will probably find them attractive as they will no longer have to remember, for example, if `&&` is a *bitwise* and or a *logical* and.

If you find such use seductively attractive let me mention a short program written one evening by a small group of technical experts during the recent WG21/X3J16 meeting. They managed to write a program that contained 25 consecutive keywords, all different. *Obfuscated C* has nothing to compare. I am not sure how we should feel about the fact that two of the main perpetrators of this monster were UK technical experts. Of course if you were allowed to re-use keywords much longer expressions would be possible.

Towards better style

As you can see it's not the introduction of new keywords that will make C and C++ code clear and readable. So in a future column I'll concentrate on programming style. How to write, today, *good* programs in C++ which will be able to take advantage of the new additions to the language. ■

Subscriptions: individual £14, student £7, corporate £75, Overload & C++ SIG £15 (+ACCU membership). For further information about ACCU write to Francis Glassborow, 64 Southfield Road, Oxford, OX4 1PA, ring 0865 246490 or email francis@robinson.demon.co.uk.

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Speak to my agent

Agents are essentially software that works on your behalf. **David Mery** reports on how they will make computing power more accessible in the future.



The Oxford Dictionary defines an agent as 'a person who acts for another in business.' But agents are not necessarily restricted to humans. And since EXE is a software developers' magazine I have chosen this month to write about agents in the software world. Agents are not new. They were created and studied in research labs since the seventies. Although commercial products based on this technology are just appearing. The most talked about is the Telescript language created by General Magic, an Apple spin-off (see the box below).

So who are these agents? You may have already heard of them under another name. Doug Riecken, in the July edition of *Communications of the ACM* listed several common terms used to describe agents: 'intelligent agents, intelligent interfaces, adaptive interfaces, knowbots, knobots, softbots, userbots, taskbots, personal agents and network agents'. And this list is not complete. You could add 'smart agents' to it.

At least one of these terms should ring a bell. *Personal assistant* was the term used by Apple, a few years ago, to describe Phil in the futuristic video *The Knowledge Navigator*. Phil was represented on screen as a man's face with a bow tie. He helped the main character, a professor, and reacted to situations by showing expressions.

He would be considered quite intelligent and knew a lot about the professor. During the video, Phil was managing the interactions between the professor and the com-

puter, for instance screening incoming phone calls or helping to find some information...

A better analogy comes probably from MIT's Media Lab Director Nicholas Negroponte who sees an agent as an 'English butler' in the way, as in Apple's video, he answers the phone for you and knows when you don't want to be disturbed and what to say to the caller.

Reaching into the future

Alan Kay another precursor in the fields of agents gave one of the best descriptions back in 1990 in a *Byte* article in which he wrote, 'in 10 years, we will be hooked up to more than a trillion objects of useful knowledge and no direct manipulation interface can handle that. People are not going to sit down with a super SQL application and start fishing around the entire world for things that might be of use to them. Instead, interfaces are going to be 24-hour retrievers that are constantly firing away doing things.'

So an agent, knowing what you like to read in a newspaper, will give instructions to other agents working at the sites of several information providers in order to prepare your *ideal* newspaper every morning. Or you could tell your personal agent when your holidays are and where you want to go. Then it would organise the plane booking, taxi to go to the airport, hotel etc. If the plane is delayed it will automatically modify the taxi booking and ask your alarm clock agent to let you sleep a little longer.

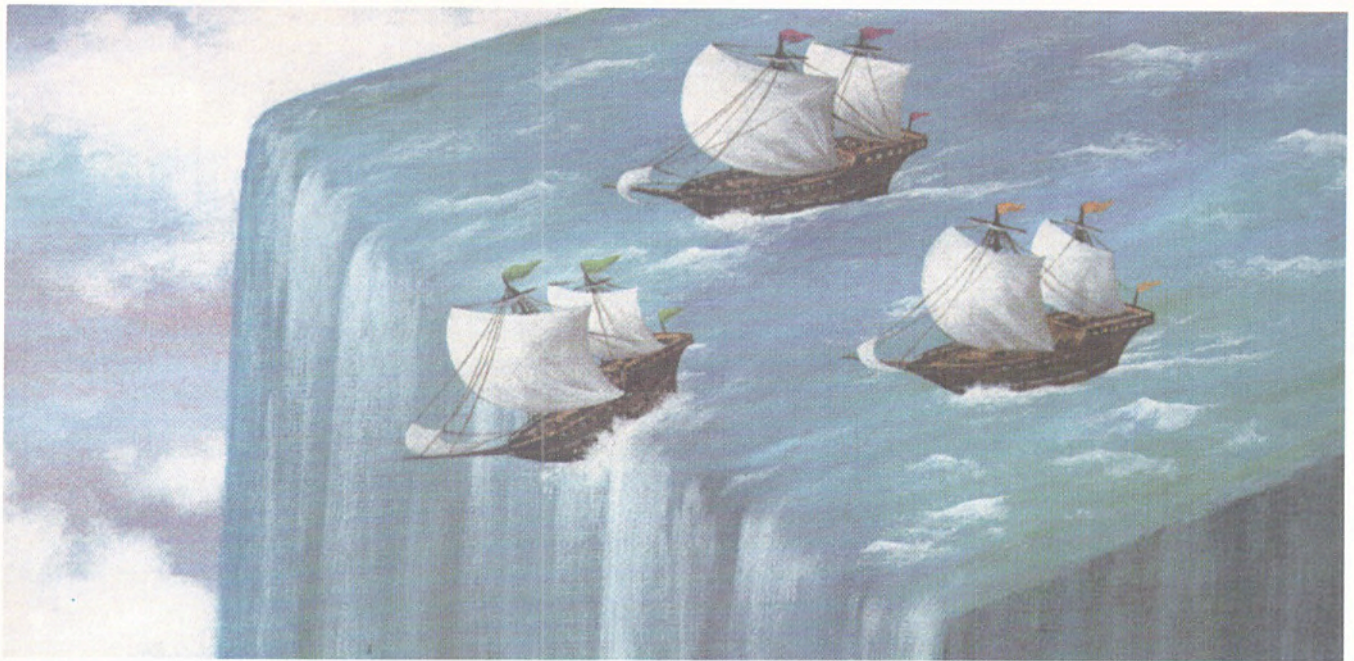
A social organisation

Traditionally AI takes human knowledge and human reasoning as its model. The agent approach takes its model more from social organisation: how people or agents, interact together. That's why agents are mainly, but not only, studied in a field called Distributed Artificial Intelligence (or DAI). Problem solving is viewed as a cooperation between a set of agents. They form a community of experts.

Probably the main thrust for agent technology today and the reason for the first appearance of commercial implementations is the generalisation of networks and the mobility of users. Until recently PC and workstation software was essentially single user software, working on its own, accessing net-

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Figure 1 - Finding agents



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- Application Development Trends Magazine, June 1994



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The first large scale commercial implementation

General Magic, an Apple spin-off, is working on two main products, Magic Cap, an integrated platform designed for communication, and Telescript, an agent based communication language. The Telescript technology defines an agent language and a 'Telescript engine' to execute these agents. Telescript caters for remote programming. In General Magic terminology: an *agent* can go from one *place* to another. Agents can *meet* in a place or *connect* from one place to another.

A typical application is written in C or C++ for the business logic part of the application and in Telescript for the communicating part. Telescript is a dynamic OO language where all the data storage is persistent. Telescript agents are interpreted by Telescript engines.

On September 28th last year, Sony announced the MagicLink Communicator and AT&T, PersonaLink Services. The MagicLink implements Magic Cap for its interface and Telescript to communicate with Telescript compatible services. Today this means PersonaLink. According to Marc Porat, Chairman of the Board and CEO of General Magic 'Telescript technology will make electronic markets a mass culture reality. The Telescript language is an agent-based language that allows supply to find demand.' This electronic marketplace, like PersonaLink, is a set of places where a customer agent can meet service provider's agents.

Autonomous agents

Pattie Maes, assistant professor at the MIT Media Lab, is studying autonomous agents. Her interest is in projects where 'instead of user-initiated interaction via commands and/or direct manipulation. The user is engaged in a cooperative process in which human and computer agents both initiate communication, monitor events and perform tasks.'

She's working on two experiments. The first one is an agent that makes recommendations to the user on what to do with incoming mail. For example, 'read them', 'read them urgently', 'bin them'... The agent learns what to do automatically by 'watching over the shoulder of the user'. There is an initial training phase but the user never needs to teach the agent explicitly what to do. The agent reports its state (working, suggestion, unsure) and how confident it is in its suggestions (gratified, surprised, pleased, confused) by a set of icons.

The other project is a news filtering agent which assists the user in the filtering of online news. In this project the agent needs to be bootstrapped by being trained with positive and negative examples of articles to be selected or not.

Fixed agents in the phone network

One group at BT Lab in Martlesham Heath, The Intelligent Systems Unit, is prototyping a distributed set of fixed intelligent agents. They

will eventually have the responsibility for certain parts of the network. The first goal is for agents to be able to negotiate in a consistent manner and to interpret the status of the network and the aims of the customers. The service agents should be able to inform customers' agents of all the new services proposed and update the information whenever network conditions change. The second goal will be for agents to control the real physical hardware directly to have a community of agents in charge instead of a central controller. When this phase is reached each network node should be controlled by an agent so if a node fails, other agents can co-operate to heal the network.

The current phone networks, the POTS (plain old telephone system) is about to saturate world-wide. Chris Winter, Senior Professional in the Agent System Research group explains 'We want you to have customer agents.' It will give BT the possibility to dimension its network according to demand and so reduce the global cost of the infrastructure while at the same time giving the opportunity to react faster to new requests. Agents should reduce processing needs and control traffic on the network while at the same time increasing its modularity and resilience.

BT Mobile

Another group at the BT Lab is working on *mobile* agents. This group is looking at agents from a completely different perspective. Stephen Appleby from the system research division and Simon Steward from the cybernetics group consider that for agents to be robust in a telecommunications network. 'There should be no direct inter-agent communication. The agents should be present in reasonably large numbers and should be able to alter their task allocations and numbers dynamically.'

How can agents communicate and evolve if there is no direct communication? BT's solution is for agents to leave a trail by modifying the state of the system that they control or leaving data in the nodes of the network. In the system every agent is relatively simple so there must be a significant number of agents to carry out tasks effectively. This results in a gradual degradation of performance if agents die. In fact the number of agents working is dynamic, some die or are killed if there's not much work to do and some are created when there is more demand.

This type of agent is rather different to the ones in the other experiments described above. It is inspired by works carried out in the field of robotics. Rodney Brooks from the MIT showed that the task of building robots with a central complex processing unit is too complex. So instead, he's working on developing lots of very simple, 'stupid', robots where 'intelligence' emerges from the society of these agents. In this architecture competence levels are organised in a hierarchy of layers. This theory, also used as a model for the brain, is called the subsumption architecture.

works only to print or store information. It's now time for a more evolved use of networks. Agent technology should facilitate the creation of such software.

Agent-based software is often thought of as being related to object oriented programming. The main difference is that the messaging protocol is independent of the implementation and the function of the agents. Since agents can evolve simultaneously in a machine or in a network, actor languages are particularly well suited to code them. The actor model is simple. Everything, code and data, is represented by an actor. Only one thing can happen in an actor system, an event. Each actor has a role. It's functions are triggered by messages. Instead of the inheritance hierarchy of the classical object model, actors do not

have classes. But when they don't know how to process a message they *delegate* it to a *proxy*.

Static or mobile?

So agents respond to events according to a script. Within this framework there are two very different types of agent, fixed and mobile. The second category seems more powerful but some organisation favour the first type as they are frightened of rival agents. Instead of sitting in your PC, mobile agents can move to other machines, of service providers for instance, and work there. They will come back only when they have finished their work. One big advantage of this mobility is when communication is expensive. Instead of having to connect regularly to see if the information you want is

available. You will only need to make two connections: one at the start and one at the end of the process. This result in an optimisation of the used bandwidth. It should prove very useful when people start using more wireless devices with a narrow bandwidth.

The awakening of agents

Even after 25 years or so of research, intelligent agents are not yet the latest computer revolution promised with every new technology. Up to now only some researchers working in related fields have been aware or involved in the progress of agents. But the arrival of agent based consumer market products backed by large, well-known, companies might change the general level of awareness. ■



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Let the truth be revealed...

Dave Jewell tackles some of the controversial design issues that Windows 95 seems to have aroused....



Contrary to what Microsoft might want you to believe, Windows 95 isn't what might be called a 'real' 32-bit operating system. As someone on CIX recently expressed it, 'You can either have a 32-bit operating system and try to be compatible, [with 16-bit Windows applications] or else you can have a compatible operating system and try to be 32-bits!' Windows/NT, of course, is an excellent example of the former, while Chicago (oops - Windows 95) definitely falls into the latter category. Windows 95 bends over backwards to be compatible with existing 16-bit Windows and DOS apps, whereas NT is first and foremost a 32-bit operating system that was written from the ground up by Dave Cutler and his team.

24 bits and counting....

Although Windows 95 supports much of Win32 (the 32-bit Windows API), a surprisingly large amount of this support devolves behind the scenes onto existing 16-bit code. For example, it's an open secret that the vast majority of the 32-bit API functions implemented by the USER library actually thunk down onto the 16-bit library code that we all know and love. This should come as no surprise. A cursory glance at the respective file size of the 16-bit and 32-bit components will show that the 32-bit USER library is less than a tenth the size of its 16-bit counterpart!

A similar situation pertains with the GDI components. The GDI32.DLL is about one third the size of the 16-bit GDI library. If you examine it in detail you will find that it thunks down onto the 16-bit code too. Although, in practice, the 32-bit GDI module does a lot more work than the 32-bit USER code and 'thunks down' to a lesser extent.

Giddy segments

Both the 16-bit USER and GDI libraries are 'hybrids' in many ways. For instance if you run the EXEHDR utility on GDI.EXE, you'll see that it contains a number of 32-bit segments. The 16-bit USER code has a fascinating implementation of a local heap. The first 64 KB of the heap 'look' like a normal 16-bit

heap and can be accessed in the usual way. However, the total size of the heap is considerably larger than this and anything above the 64 KB limit can only be accessed with a 32-bit pointer. On entry to the USER library's API routines, a parameter validation layer authenticates incoming 16-bit window handles and maps them to 32-bit offsets within the heap. Naturally, the big advantage of this approach is that it alleviates the dreaded 'System Resource' problems of Windows 3.1. That's not to say that these problems have gone away completely, but you do at least have a sporting chance of running more than a couple of Microsoft Office applications under Windows 95.

Perhaps most interesting is the 32-bit KERNEL library. According to Adrian King, author of *Inside Windows 95*, 'The KERNEL32 module is completely independent of its 16-bit version.' Don't you believe a word of it. If KERNEL32 is independent of WIN386.EXE, then I'm Queen Victoria! If you've read Andrew Schulman's excellent book, *Unauthorized Windows 95*, then you'll know that this simply isn't the case. The 32-bit KERNEL code calls down to the 16-bit KERNEL at various points using a number of nefarious thunking techniques. Incidentally, it's no use employing a utility such as EXEHDR (or my own SEXYHDR program) to look for dynamic link imports from KERNEL16 into the 32-bit KERNEL code. Thunks are very different from dynamic links.

Thunk rock

One of the key issues affecting the design of Windows 95 concerned the role of the 16-bit USER library. As has already been mentioned, virtually all 32-bit USER API calls get thunked down to the 16-bit code, meaning that even 32-bit applications call the 16-bit code on a very regular basis. Unlike its predecessors, Windows 95 shares NT's ability to schedule Windows applications on a preemptive basis. Under Windows 3.1, all Windows applications live in the same Virtual Machine (VM). They each get CPU time using cooperative multi-tasking. In

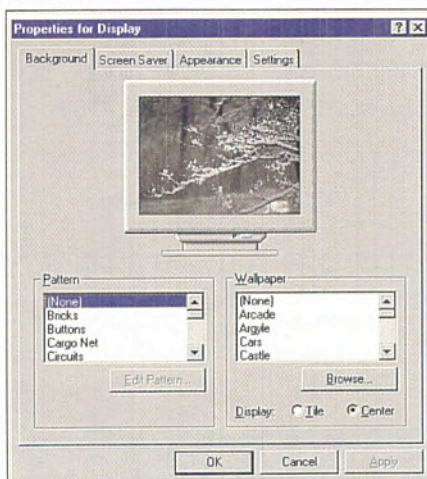


Figure 1 - Tab dialog boxes are used to set properties

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practice, this means that each application must be relied upon to call one of a certain small number of API routines which can potentially perform a task switch behind the scenes. `PeekMessage` is a good example of such a routine. When an application calls `PeekMessage`, one or more other tasks may get a chance to execute before `PeekMessage` returns to its caller, assuming that those tasks have messages waiting. Windows 3.1 can preemptively multi-task only across VM boundaries, *either* between the 'System VM' (the VM containing all the Windows applications) and a DOS box, *or* between any two DOS boxes. It is simplest to regard 3.1 as a true multi-tasking system, if you're prepared to treat all running Windows applications as a single, monolithic 'super-program'.

Under Windows 95, this is no longer the case. Windows applications are fully preemptive with respect to each other. This is good news for Windows users and developers, but a major headache for the implementors of the system. Microsoft made the decision to stick with the 16-bit USER library, allegedly for two reasons. First, it is tried and trusted code, and second, 16-bit code is generally smaller than the equivalent 32-bit code. (Apparently, Microsoft felt that rewriting the USER code for 32-bits would violate its design requirement that Windows 95 run acceptably well on a 4 MB system).

The big problem with the 16-bit USER code, of course, is the fact that it was never written to work with preemptive applications. USER16 was never written in a re-entrant fashion. There are numerous places in the USER library where some global variable is used as a temporary storage area for some operation. As an example, consider the seemingly innocent little API routine, `FindWindow`. Like many API routines which need to search through a large number of windows, `FindWindow` calls an internal routine called `BuildHwndList`. This routine returns a handle to a data structure which, in essence, is a simple array of window handles. Microsoft also use `BuildHwndList` in many of the `Enumxxxx` routines such as `EnumWindows`. Now consider what would happen if you called `FindWindow` within an enumeration call-back routine whose address you'd passed to `EnumWindows`. Although this is, on the face of it, a perfectly reasonable thing to do, it involves two separate calls on the `BuildHwndList` routine. These have to maintain two entirely separate window lists at the same time; one on behalf of `EnumWindows` and one on behalf of `FindWindow`. The `BuildHwndList` routine gets around this problem by inter-

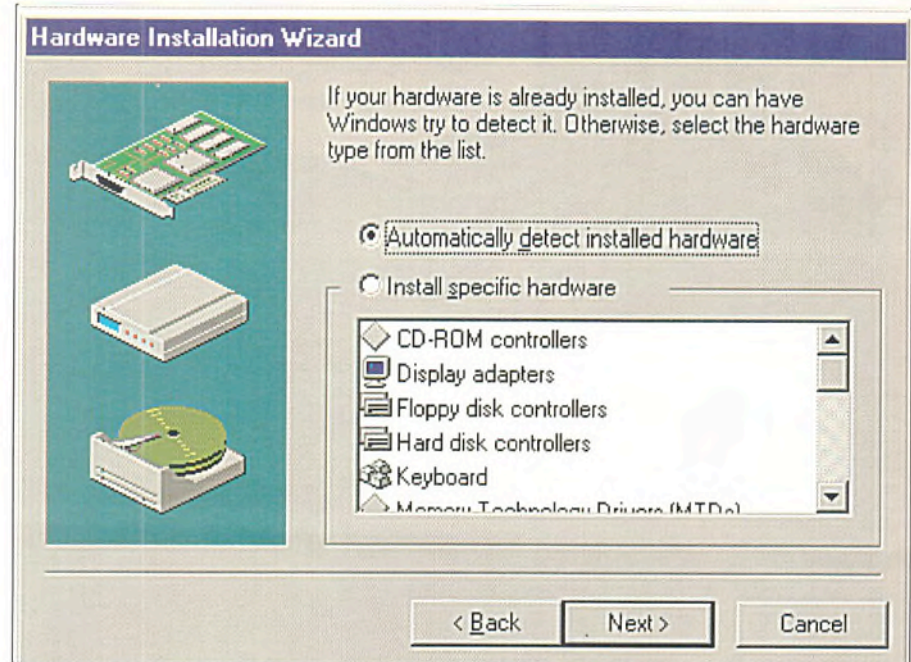


Figure 2 - Hardware setup wizard in action

nally maintaining a linked list of window lists (so to speak), an approach which works fine for Windows 3.1.

However, in a fully preemptive system, linked lists can potentially spell big trouble. In the Windows 3.1 implementation of `BuildHwndList`, a global variable called `pBWLList` is used to point to the first allocated window list. If a task spotted that this variable was `NULL`, it might allocate a window list and store the list address in `pBWLList`, not spotting the fact that a second task has just done exactly the same thing! Similar problems arise when managing pointers in linked lists, compounded when you have a doubly-linked data structure with forward and backward links. Some other task might come along while you're inserting or deleting an entry and find the list in an invalid state. It is because of issues like this that true, preemptive operating systems such as Windows NT have the concept of a 'critical section'. NT defines a critical section as a block of code that requires exclusive access to some shared object before it can execute.

Dread locks...

Because Windows 3.1 relies on cooperative multi-tasking, it has little or no concept of a critical section at the level of the USER library code. Much of the code here would fall flat on its face in a preemptive environment. The USER code in Windows NT, on the other hand, was written from the ground up to be fully reentrant, where possible and to use critical sections where not. The designers of Windows 95 implemented a system-wide mutual exclusion lock, `Win16Lock`, to prevent more than one cli-

ent from using the 16-bit USER code at the same time. Incidentally, you may have heard `Win16Lock` referred to as `Win16Mutex`. This political name change was presumably made because it was felt that the word 'Lock' had too many negative connotations as in 'lock out'. However, the low-level undocumented routines still use names such as `GetpWin16Lock`, `ConfirmWin16Lock`, etc, so `Win16Lock` it is! I imagine that it takes a while for the marketing department's idea of Political Correctness to work its way down to the lower echelons...

`Win16Lock` is actually a semaphore, implemented using the VxD `Wait_Semaphore` mechanism. It effectively locks access to the 16-bit USER and GDI subsystems. While a particular thread is executing a 16-bit API call, the `Win16Lock` semaphore prevents any other thread from getting in. When news of `Win16Lock` first emerged, Microsoft went to some lengths to point out that the semaphore would only come into play for 16-bit applications. True 32-bit Windows applications will be unaffected by the `Win16Lock` mechanism because they never need to call the 16-bit libraries, so the argument went. This argument was shown to be entirely fallacious once it became clear how greatly Windows 95 still depends on the existing 16-bit code. Both 32-bit and 16-bit clients will effectively contend for `Win16Lock` on a frequent basis since USER (and to a slightly lesser extent) GDI both make frequent calls on the underlying 16-bit code. Indeed, as pointed out earlier, Schulman has discovered that even the `KERNEL32` code sometimes thunks down to `KERNEL16`, so it's possible that even 32-



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bit KERNEL calls may occasionally pend on the Win16Lock semaphore.

From an architectural viewpoint, Windows 95 certainly multi-tasks better than Windows 3.1. It is no longer dependent on a particular application issuing certain API calls (SendMessage, PeekMessage, etc) on a regular basis in order for other tasks to get processor time. At the end of the day, the Win16Lock mechanism, although undoubtedly offensive to operating system purists, does represent a reasonable design compromise. By ensuring the continuance of the 16-bit Windows subsystem, it allows Microsoft to retain a high degree of backward compatibility with existing 16-bit Windows applications while at the same time keeping the memory requirements of Windows 95 to a minimum.

It's to be hoped, though, that Windows 95 contains a recovery mechanism which allows the operating system to pick up the pieces were a crash to take place inside the 16-bit Windows subsystem. In the worst-case 'nightmare' scenario, this would leave the Win16Lock semaphore asserted with all other tasks (both 16-bit and 32-bit) indefinitely locked out. Hopefully, the GPF handler is designed to clear the Win16Lock flag under such circumstances.

Who's kidding who?

Aside from the Win16Lock issue, another area of contention between the marketing droids on the one hand and the real world on the other has been the issue of DOS. When you boot Windows 95, you're almost immediately presented with a fancy graphical screen in which Windows logos bounce around while you wait for Windows itself to start. From the perspective of a naive computer user, the dreaded DOS command line has completely disappeared. This of course, is just the impression that Microsoft want to give. Behind the scenes, however, good old real-mode DOS is swinging into action to load Windows into memory.

Many moons ago, Microsoft chose to hide MSDOS.SYS and IO.SYS in the root directory of your boot drive. More recently, DBLSPACE.BIN joined them and now, with the advent of Windows 95, you'll find that there's quite a little private party going on in your root directory. All the more so if you've also installed Windows/NT onto your system! Not all this partying is perhaps as seamlessly integrated as one might hope. For example, if you're dual booting Windows 3.1 and Windows 95, a lot of surreptitious file renaming takes place on the fly. Boot up DOS/Windows 3.1 and you'll find that the Windows 95 versions of COMMAND.COM, MSDOS.SYS, CONFIG.SYS and so on have been safely tucked away by

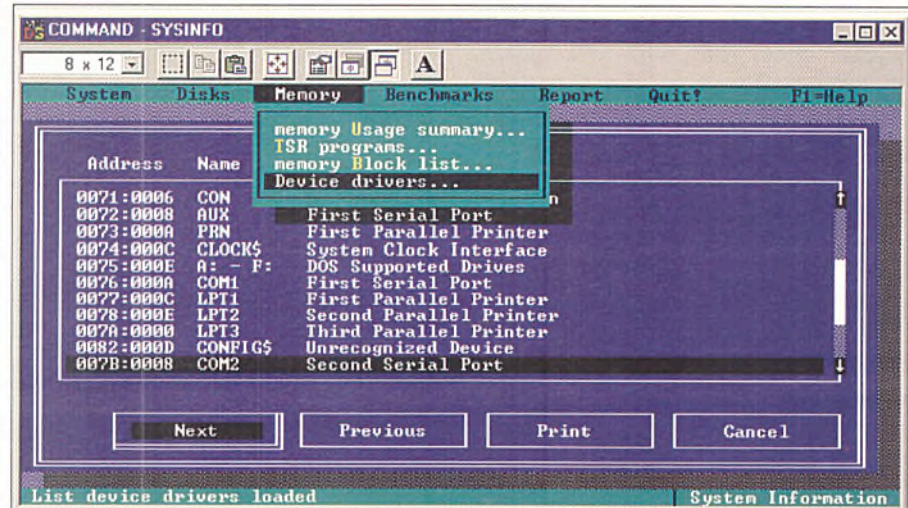


Figure 3 - Proof! Real mode DOS device drivers reports Norton Utilities

giving them a suffix of .W40 (Hmmm....sounds a lot like Windows 4.0 to me. Shouldn't this be .W95?) On the other hand, if you fire up Windows 95, you'll see that the DOS version of these files have magically got an extension of .DOS.

Allegedly, Microsoft has implied that the only software market it has no interest in the long term is computer pornography

To enhance the illusion of seamless integration, the Windows 95 version of IO.SYS has been renamed to WINBOOT.SYS. This file sounds awfully Windows oriented but it isn't really. Load it up under a debugger of your choice and you'll find our old friend, the DOS BIOS, along with its partner in crime, the CONFIG.SYS parsing routines. Tacked onto the end of this is the new stuff that handles interactive startup menus, the graphical boot screen, and so on.

If you have an AUTOEXEC.BAT file in the root directory, Windows 95 will load COMMAND.COM in order to parse it. Figure 3 is a screen shot of Norton Utilities under Windows 95 showing the ever-present DOS device drivers.

Hey good lookin'

As I'm sure you appreciate, the mere act of running your application under Windows means that the application will (to a greater

or lesser extent) take on the Windows 95 look and feel. You'll get the new style caption bar with the new iconise, maximise and close boxes all together on the right hand side of the caption bar and a miniature version of the program icon on the left. All the built in Windows control classes (BUTTON, EDIT, SCROLLBAR, etc) have new WM_PAINT handlers so that your application automatically gets the new '95 look'. The scrollbar control now sports the long-awaited variable sized thumb (as used in many Unix-based systems) indicating the proportion of a document which is actually in view.

On top of this, Windows 95 includes a large number of new user interface gadgets that make it very simple to build a significant 'wow' factor into your applications. The freely distributable COMCTL32.DLL contains new toolbar and status bar classes. The toolbar allows you to easily add very sexy looking toolbars to your applications and you can incorporate checkboxes, radio buttons and combo boxes into the toolbar as desired. A particularly nice feature here is the built in support for what Borland calls 'fly-by hinting'. Users of Microsoft Office applications such as Word for Windows 6 will know that as you move the cursor over toolbar controls, a small hint message pops up to tell you what each control does. To enable fly-by hinting, you simply specify the TBSTYLE_TOOLTIPS window style when creating the toolbar. Then, whenever a hint string is needed, the toolbar will send a WM_NOTIFY message to the parent window. You can provide the text string information directly or preferably (from an internationalisation point of view) specify the ID of a string resource where the hint string is to be found.

One gadget that's sure to be well-used is the RTF (Rich Text Format) text control. This is a sort of super-set of the standard Edit control that supports a subset of the

RTF format. In Beta 2 of Windows 95, the control lives in its own DLL (RICHED32.DLL). It is not yet clear whether or not it will become part of the COMCTL32 library. The RTF text control implements most of the standard messages provided by the Edit control and a lot more besides. Some of the most important features of the new control are text display in different fonts, sizes, colours and styles (including subscripting, superscripting and strikethrough), left and right text alignment and tabs. There is also support for bullets, printing and print previewing, OLE 2.0 client support and the ability to hold more than 64 KB of text.

Yet another new 'common control' is the near ubiquitous 'tabbed dialog' control. At least, everybody else refers to them as tabbed dialogs. Microsoft prefers to call them property sheets. These are used very extensively in Windows 95. The same look and feel will undoubtedly be emulated by independent software developers. The property sheet mechanism will also let you create a 'wizard' very easily.

In addition to the improved visual cosmetics and the preemptive multi-tasking, there are a lot of other attractive new features in the forthcoming operating system. There's a standardised installation system,

plug and play support (see Figure 2), built in network support, disk compression, a recoverable trash can and more.

**If KERNEL32 is
independent of
WIN386.EXE, then I'm
Queen Victoria**

Evolution not revolution

From a purely personal point of view, I find it reassuring to discover that Windows 95 is somewhat less of a quantum leap, technologically speaking, than Microsoft would have you believe. It represents the next logical progression on a road which began with Windows 1.0 and really got under way with the advent of Windows/386 - that little-used precursor to Windows 3 which nevertheless introduced much of the VM technology that's still being used in Windows 95. Because Windows 95 is evolutionary - rather than revolutionary, you can have some confidence that the technology will be reason-

ably mature and stable. Just as importantly, you can be confident that the public will buy it in droves.

Windows 95 includes so many features 'as standard', that Andrew Schulman, in his introduction to *Unauthorized Windows 95*, stated that the new system will demolish a number of cottage industries (such as the sexy add-on control market) and put a lot of small, specialised vendors out of business. Allegedly, Microsoft has implied that the only software market it has no interest in the long term is computer pornography! Maybe in years to come we'll all be earning a niche living developing computer software that's sexy in every sense of the word! Hopefully, this view is a needlessly pessimistic one. I'm excited about the prospect of developing for Windows 95. In the coming months, we're going to be taking a more in-depth look at some of the facilities offered by the new operating system. ■

Dave Jewell wears many hats, working as a technical journalist, programmer, and Windows consultant specialising in low-level systems chicanery. When not busy swapping hats, he's writing a couple of books on Delphi 95 and on the internals of Windows 95. You can reach Dave via email as djewell@cix.compulink.co.uk.



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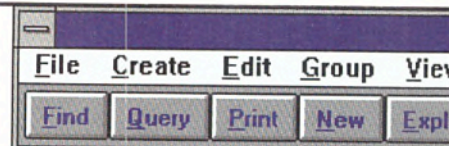


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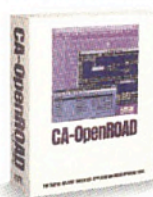
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The GNU story

The best things in life
are free. Especially 

when they happen to be high
quality, high performance
software development tools.

Niall Mansfield is hooked on
GNU.

GCC has been around for seven or eight years. In that time it has gained an excellent reputation. It offers good performance. Programs compiled with GCC are usually faster than those built with other compilers. It is high quality, as are the rest of the GNU tools. It works well, tends to have fewer bugs than most commercial equivalents and rarely lets you down.

For a long time GNU C was considered to be the best compiler by far for VAX/VMS systems. And best of all, it's free! We can obtain the source code free over the net, or cheaply on CD-ROM and build GNU C ourselves. What's more, we can give away the compiler we have built and we don't have to pay anybody. But note that while the software is free it is not public-domain. For details see the box *The Free Software Foundation and the GNU Public Licence* for information regarding distribution rights.

GCC has been ported to dozens of different systems. Because you can have exactly the same compiler on all your different platforms, it can form the basis of a completely standard development environment throughout your organisation.

Supported platforms include Sparc (SunOS 4.1.x and Solaris-2), IBM RS/6000, HP9000, MS-DOS, DECstation and DEC Alpha, Silicon Graphics, Intel 80x86 (SCO Unix, Interactive, Solaris, SVR4...) VAX/VMS, VAX Ultrix and lots of others. Over the last few years GCC has been extended to handle C++. A wide range of related software has been added too.

Got to build it first

Building GCC is much easier than it used to be. I would say that it is now very straightforward. There are five basic steps to GNU C. First, use the `configure` utility to specify the machine and operating system configuration you want to build for. Then compile the GCC sources with your existing compiler.

Next, recompile the compiler with itself, that is, with the compiler built in the previous step. The compiler is now ready for testing by compiling it with itself again and comparing the object files which are produced. Finally, the compiler created in this stage is the one we will install on our system.

Putting in the boot

We'll look at these steps in more detail below. But first, consider how to compile GCC if we don't have a compiler in the first place? The short answer is, we can't. This is the origin of the term 'bootstrap': using a compiler to compile itself before you have compiled it is like somebody trying to lift themselves into the air by pulling on the straps (laces?) of their own boots. It's an impossibility!

In the very early days, compiler developers had to write their compilers in gradually more complex chunks. First write an elementary translator in assembler, then write a better translator in the language this translator accepts and translate it. Then write a better translator in this slightly better language and so on... However, this route isn't practicable or necessary now. If we don't have a C compiler, we can always obtain a pre-compiled version of GCC over the net, or get a copy from a friend. It doesn't matter if it is old or an early version of GCC since we'll only use it during the build and can throw it away afterwards, once we have created our shiny new GCC compiler.

The build in detail

All the build times I will quote in this article are based on a Sun Sparc IPX with 16 MB RAM. To start with we copy the source files onto the disk where we are going to build. During the build we will need between 80 and 100 MB altogether. Of this, 67.2 MB is taken up by the source code. The final built version, in 'our-gcc' is 8.6 MB. We will also need a few megs of temporary space (/tmp).

Next we use the `configure` utility to specify the machine and operating system we want to build for. As GCC (and other GNU software) became more and more widely used and ported to lots of different systems a good deal of work went into parameterising the build. Specific hardware dependencies have been localised into hardware-specific files. Similarly, details specific to a particular operating system have been isolated too. So supporting one operating system on two different hardware types (eg Solaris-2 on Sparc and on 80x86) or two different operating systems on the

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same hardware (e.g. Unixware and SCO Unix on 80x86) is relatively easy. All this is brought together with a tool called **configure**, which enables us to define the target machine we are building GCC for and then sets up all the necessary Makefiles and other configuration details. For example, if we wanted our version of GCC to go in a non-standard directory, we would use the command:

```
./configure --prefix=
/working/our-gcc
```

All other information would be picked up automatically by **configure**. Running **configure** takes about 20 seconds. When it is done we can now start the build proper.

Then we invoke the **make** command to compile and link the GCC sources as follows.

```
make LANGUAGES=c
```

Notice that we are only building the C compiler at this point, not the C++ compiler and other tools. This is because we'll be throwing the build away very soon. Building extra tools would just be a waste of time, especially given that the time taken to complete the build of the C compiler is in the order of 60 minutes.

The next step is to move the version of the compiler we have just built to a temporary directory, say **stage1**, with the command:

```
make stage1
```

This will take about 20 seconds.

Now we recompile the compiler with itself. In other words we compile and link the GCC sources with the version of the compiler that we have just built (ie **xgcc** in the **stage1** directory).

```
make LANGUAGES="c proto"
CC="stage1/xgcc -Bstage1/"
CFLAGS="-g -O"
```

The **proto** above refers to a dummy language-name in the build Makefile to invoke utilities for converting source to ANSI function prototype format. These are useful but not essential. The build process will take approximately 52 mins.

At this stage if we are short of disk space, we can delete the temporary directory **stage1** and its contents. If we wish, we can now install and use the compiler we have just built. However, it is best to test the compiler by compiling it with itself again and comparing the object files which are produced. To do this we must first move the version of the compiler we have created into another temporary directory, say, **stage2**.

```
make stage2
```

Then we recompile the sources using the **stage2** compiler as follows:

```
make LANGUAGES="c proto"
CC="stage2/xgcc -Bstage2/"
CFLAGS="-g -O"
```

This will take about 35 minutes.

Now we compare these new object files with the **stage2** files:

```
make compare
```

The process takes only two minutes. We now have a compiler in which we have proved to work. We can install the build of GNU C with the following command:

```
make install
LANGUAGES="c proto"
CC="stage2/xgcc -Bstage2/"
CFLAGS="-g -O"
```

Notice the way in which we repeat the arguments to **make** to avoid needless recompilation of files. 150 seconds later and we have our GNU C compiler ready for action.

There are many extra options that can be specified explicitly, for example whether GCC is to use the GNU assembler and linker and (for a few hardware types) whether the target machine has an in-built floating-point unit. Full details are given in the **INSTALL** document in the distribution. Documentation on both building and using the compiler is included in the *Using and Porting GNU CC* document. This is about 450 pages long and is in 'texinfo' format. Use TeX or LaTeX to convert it to a printable form, or the GNU emacs 'info' documentation reader to use it online. It is also possible to buy it ready-printed in book format from the Free Software Foundation.

Using the compiler

We can use GCC in the same way we would with any other C compiler, although some of the more detailed options, such as specifying warning levels and compatibility modes are specific to GCC. A very useful option is **-v** (verbose mode) which prints the sub-commands GCC is invoking to compile, assemble and link our code. It provides a lot of useful information including the version of GCC that is being used, which directories are searched for header files and which assembler and linkers are being used.

It also shows the structure of the installed GCC directories. Under **lib** and **gcc-lib** we have the platform specific directory (**sparc-sun-sunos4.1.2**). Be-

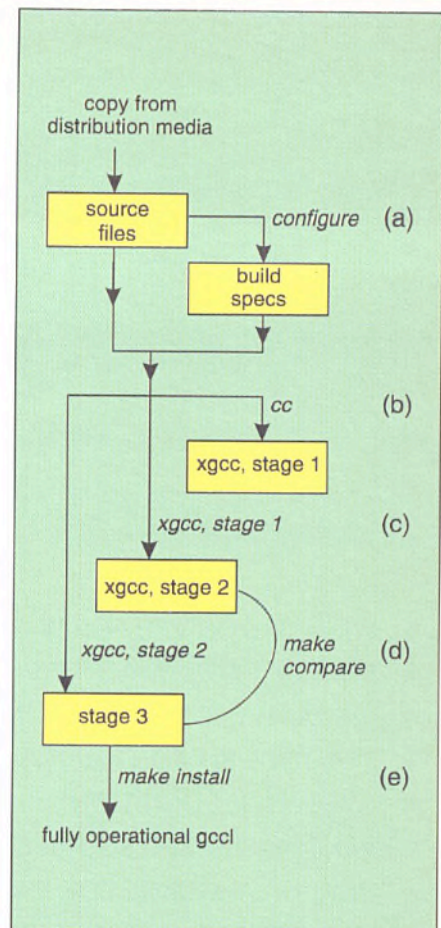
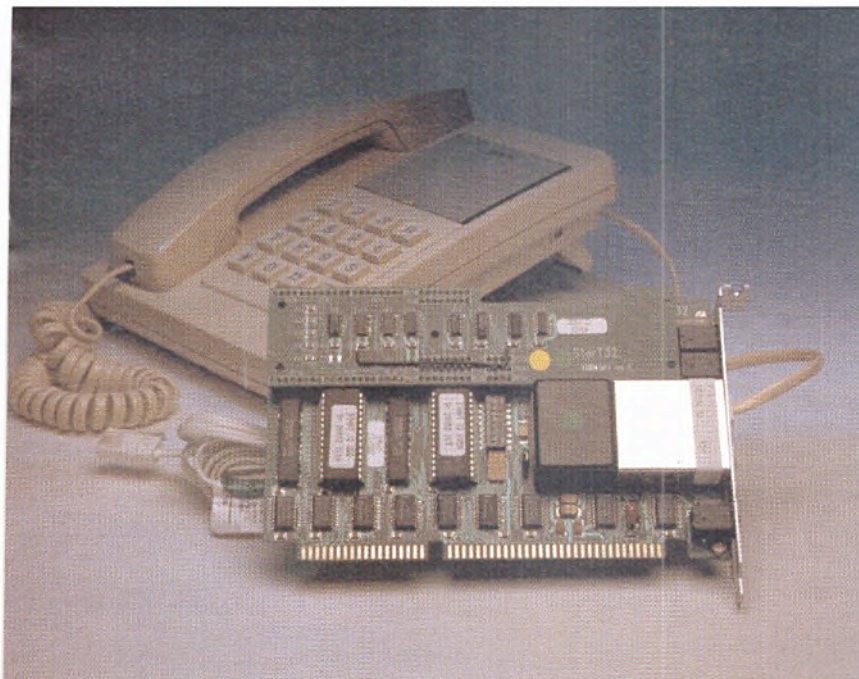


Figure 1 - Schematic diagram of building GNU C

neath that we have files specific to the version of GCC. The structure allows us to maintain and use several different version numbers of the compiler, as well as variants for several different platforms. We'll look at this in more detail in the section on cross-compiling, below.

Related software

The Free Software Foundation (FSF) is working to provide GNU versions of all the standard development and utility software tools. Currently available are all the tools required to compile C and C++ on most common systems. The most extreme case of this is where neither compiler, nor header files nor C libraries are bundled with the standard operating system. For example with SCO Unix we can now get GNU versions of everything we need. In effect we have a completely free development kit! The components of such a kit would comprise the GCC compiler itself, the GNU C pre-processor, which is included with GCC, and header files for both standard C library functions and for platform specific parameters. Then there is the C standard library and other function libraries and the GNU linker which is a part of the GCC build anyway. We will also have the GNU assembler,



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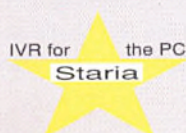
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GAS, to translate the symbolic assembler code emitted from GCC into a machine-code object file. If we want C++, we can add the GNU `libg++` class libraries

Most of the programs listed here are in the GNU distribution `binutils` (utilities for operating on binaries), which includes `ar`, `as`, `nm`, `ranlib`, `size`, `strings` and `strip`. The C library and header files are in the GNU `glibc` distribution. The C++ class libraries are available in the GNU `libg++` distribution. All the GNU software uses (or soon will use) the same `configure` mechanism as GCC does, so building these extra components is again quite straightforward.

As a cross compiler

Because GCC stores its various components in separate platform-specific directories as we described above, it can maintain copies for more than one platform type. In fact it can be built to act as a cross-compiler.

A cross-compiler enables us to compile source code on one machine, but produces output which is to run on a different type of machine. The most common use of this is for building embedded applications to run in real time systems. We want to edit, develop and debug our software on a normal workstation which offers all the usual software development support facilities. But when the program is finally ready we need to compile it to run on the particular type of chip in the embedded system. That is when we use the cross-compiler. The final binary is copied across to the target machine.

However, cross-compiling isn't only a matter of providing a GCC which will emit

assembler code for the target machine rather than the machine the compiler it is running on. We have to provide target-machine versions of all the components we listed in the previous section, viz header files and libraries, plus a cross-assembler and cross-linker. In summary, we can build GCC for use as a cross-compiler, but it requires quite a lot of work.

Support and manuals

With an Internet connection, we can FTP the GCC sources from a number of sites, including:

```
src.doc.ic.ac.uk
(directory /gnu)
and
unix.hensa.ac.uk
```

Many companies and other organizations such as user groups distribute GCC and other GNU software on CD-ROM.

Free for all

Some organisations will not use free software, because they insist that all software they use must be supported. This is no longer a valid reason for avoiding GCC, because several companies including my own now offer support and maintenance services for most of the available GNU software. There is nothing to lose and a lot to gain. So get GCC compiling!

Niall Mansfield is the managing director of User Interface Technologies. He can be contacted on email as niall@uit.co.uk.

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Mayhem!

A couple of years ago this very column was used to point out the errors in the ways of computer salesmen. 'It's so depressing when you don't listen to me.' laments **Jules**. But you didn't...



A lasting impression throughout 1994, at least in my corner of the world, was that of the growing trend within electrical appliance shops to stock a range of computers alongside the washing machines, TVs, videos, camcorders and hi-fis. Invariably, these machines were PCs, and invariably they came stuffed with more software than you could shake a stick at. The predictions of years ago have at long last come true; computers are consumer items.

A neighbour bought one of these machines. He has a house full of CD players, video recorders and camcorders, none of which he really knows how to use. But he had been made to realise the value of computer ownership after a few conversations in the pub convinced him that without one, he'd not be able to hold his head up in public, and he'd probably not be much good in bed either. So, away with him to the appliances shop.

'I'd like to buy a computer please,' he said to the assistant.

'Certainly, Sir. Here's one'

'That'll do nicely,' he said, without opening the box.

So, now he's got the computer home, he opens the first box, and finds a small pile of manuals - perhaps half an inch in total. Now, he panics, closes the box again, and comes to ask me for help. 'Can you wire it all together for me?' he asks, sheepishly. So, after wiring it together, sort of, he watches as I press the power button, and the screen bursts into life. Windows (pre-installed) boots and the program manager spits icons for all manner of programs all over the screen.

'What can I do with it?' he asks, after a pause.

'You can use it to figure out how you're going to pay for it,' I suggest. But he's not in the mood.

My friend isn't stupid. He runs a business - quite successfully, judging by the amount of high-tech junk he's got. But what he doesn't write down he keeps in his head, and it works. The pressure on him to buy a computer is immense. No doubt he's wondering what he's missing out on. I have to admit, I'm also wondering what he's missing out on, but he is more susceptible to advertising, because he knows so little.

And the problem he's facing is that he really doesn't know where to turn to get advice. What the retailers are selling is, at first sight, a headache-free way to get into computers. He didn't come to ask my advice, because he knew I'd ask him questions for which he had no answers. For example, 'What do you intend to use it for?'. The shop wouldn't ask that. Of course, the reason shops don't ask is because nobody becomes a sales assistant at one of those shops out of choice. If these shop assistants knew anything about computers they'd do the same job but charge ten times the rate for it.

But the problems come, as my friend discovered, when you get the machine home. That is when the headaches begin. These shops bundle loads of software, but give you minimal documentation, and no install disks. This is pretty serious if a file is accidentally deleted and devastating if there's a head crash. Remember, the users of these machines are novices. But it's sufficiently unpleasant the day you open the box. We couldn't install the printer he'd been sold, because the drivers weren't installed on the disk. The original build had been made from a CD, and there was nowhere to plug a CD in. How was he to know he should go back to the shop, sit on the assistant, and ignoring his protestations, beat him senseless until he supplied some working install disks? The documentation didn't say anything about that.

What these shops are selling is incomplete machines. It's like buying a car without a fuel cap or seats. They almost entirely refuse to provide any after-sales service because they can't afford to, because they've pared their profits down so far. The care and babying required by PCs, which experienced computer users take for granted, is never even mentioned by these salesmen. The customers are eventually left with a bigger headache than they started with, or a very expensive doorstep.

Personally, I think they should be stopped. I think they're taking advantage of gullible novices. But I'm clearly in a minority. These machines have bundled software, and the publishers of that software must condone these practices. If they didn't they wouldn't grant reproduction rights without requiring that disks and manuals be bun-





JAKE ABRAMS

dled too. But, just like the hardware manufacturers, software companies are feeling the pinch, and they'll take money from whoever is offering it.

It seems to me that turning the computer into a consumer appliance is probably a very good idea. It's gone wrong because only the smallest possible quantity of the latest possible technology has been made available. These same electrical appliance shops supply a range of sound-reproduction equipment varying in price from £30 to £1,000. But they don't throw in any free recordings. Nobody ever buys separate hi-fi units, unless they know exactly what they're buying. PCs have always been like hi-fi separates. The way to build this market sus-

tainably is to create niches for 'ghetto blaster' and 'midi' computers. Alongside the PCs, these companies should be supplying Psions, Amstrad notebooks, and Z88s. With the kind of buying clout that these shops could bring to bear, the differences between the machines and the problems of interconnecting them could be reduced to a minimum. Furthermore, nearly identical hardware could be packaged and sold as different products, when the bundled software is different. 'This is a recreational machine' a badge would say, or 'This is a business in a box,' and the bundled software would be somewhere which couldn't be erased, so it really would work, and continue to work, straight out of the box. This approach used

to work. It is only because machines and programs are now being sold on the basis that they can do everything, that people can no longer think of anything to do with them.

'This stuff we make' runs the commercial, 'it's powerful.' Yes, but would somebody please tell my friend what it does. 'We can't wait to see what you're going to do' it concludes. Ah, so you don't know either? That explains everything.

It's a rotten job, plugging in wires and finding install disks, but somebody's got to do it. If your high-street box is misbehaving, please don't call 0707 644185, or email jules@cix. He's got enough to cope with right here.

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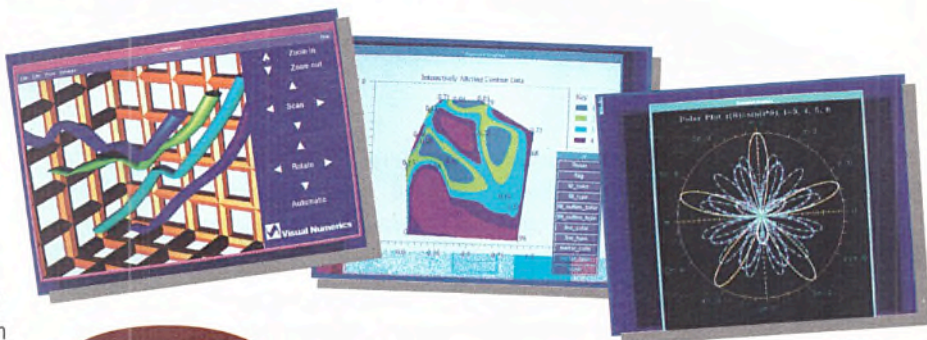
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Our man **Peter Collinson** ponders



over times past for the answer to that great question. How do Unix applications communicate with physical terminals and terminal emulations?

About 14 years ago, I was writing the kernel code that was to support our Unix systems on the local area network at the University of Kent. LAN technology was not readily available then, so we were using the now defunct Cambridge Ring method which was invented at the University of Cambridge and adopted by a number of academic sites. The plan was to connect all our machines together to allow data transfer. Perhaps the most important need was to move the handling of interactive terminals from the hosts into front-end processors located outside the machine room.

We wanted to allow a user on a terminal to select the host they wished to talk to, and for all the data to arrive in the machine room on a pair of wires instead of the rats nest of RS-232 cables required by the previous technology. All this stuff is fairly well understood now, but then it was new.

The user's terminal was connected into a Z80 based processor that was in turn connected to the Ring. The Z80 handled all the interaction with the user. It dealt with character and word deletion, repeating input and the like. When the user typed return, the 'clean' data was dispatched as a message to the host. This usually resulted in some response from the host to the Z80 in order to be displayed on the user's screen. The Z80 dealt with lines of data and composed messages that were sent to the host. The host returned lines of data to the Z80.

There were very few programs then that needed character-by-character input. Since they were mostly games we just removed them from the system. When editors such as `vi` turned up, we bravely and secretly ran single character mode over the network expecting it to die from saturation. But it wasn't a problem, it just worked.

Kernel conundrum

Terminal I/O caused an interesting problem when it started popping up inside the kernel embedded in a set of protocol messages. I needed to pass this into user processes as if the data had come from a directly connected terminal. Very early on, I decided that the way to do this was to implement a device driver that presented a standard UNIX terminal interface to the user processes.

The mapping between the needs of the UNIX system and the protocol definition was not difficult. For inbound data into the UNIX system, a line would come from the user and just be placed on the input queue. All the normal code that dealt with line reconstruction was not needed because the Z80 did all that.

For output, things were a little harder. I had to retain as much data as possible in the kernel to send a screen line to the Z80. This was fine. I just flushed the output buffer when I got a newline from the user processes. Of course, some output is not terminated by newlines, notably prompts. Prompts were handled by realising that when the shell sent one, it then immediately issued a `read` system call. So the output buffer was also flushed when a `read` system call for that line was executed. There were some occasional problems with this approach and so there was an `ioctl` call that explicitly flushed things. This made its way into a small number of programs but for the large bulk of the UNIX toolkit, things just worked.

State rules

The UNIX terminal interface holds some state information about how the device is to be handled. Much of this was not appropriate to a network connection and was either faked (we lied about line speed for example) or implemented (we could turn echo off in the Z80, so passwords were invisible).

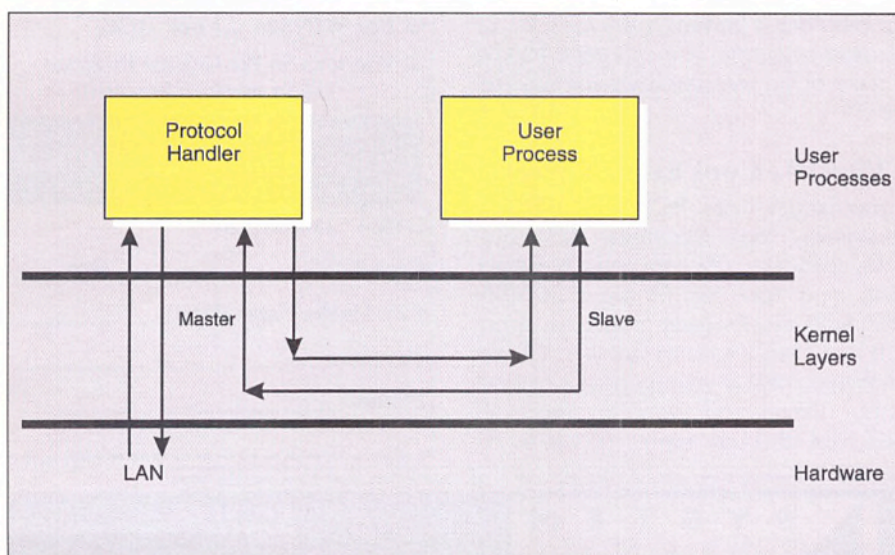


Figure 1 - Using a pseudo terminal to provide a terminal interface

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All this worked well. It lasted about 10 years, undergoing a change in underlying protocol to TS29 (the X.25 terminal protocol) at some point. The win was when we bought the second UNIX machine, with no terminals. It was commissioned by DEC, it had my system loaded and was in use by people all over the Campus in about two days.

Master and slave

I had only one terminal control protocol to deal with and a single underlying transport protocol. When Berkeley came around to solving these problems, it wanted a much more general solution. It implemented a device driver that is effectively just a tunnel in the kernel.

Each instance of the device presents a standard terminal interface on one entry in `/dev` and what may be called a 'stream' data interface at the other. Characters are pumped into the stream end using normal write system calls and appear at the terminal end as if they had been typed in. When the process wishes to write to the 'terminal', it uses the write system call to the terminal end and characters are passed through the kernel appearing at the stream end ready to be read and passed to the network. We generally refer to the terminal end as the *slave* and the stream data end as the *master*, because that is the relationship of the processes involved in handling the connection.

The whole structure is shown in Figure 1. When a user process talks to the outside world, characters flow from it into the kernel and pass to a protocol handler. This is a simple minded program whose function is to wait for data from the user process and perform the necessary system calls to convert from the stream data interface of the pseudo terminal into whatever type of communication the network needs. It also waits for data from the network and passes it into the master end of the pseudo terminal enroute to the user process.

Destination everywhere

The structure is usually setup from the network. Let's look at `rlogin`. When you start an `rlogin` program to login to another machine, it firsts connects to the remote machine using the network protocol. A start-up message is sent over the network. The message is received by the destination machine and a daemon is started to deal with the connection. The daemon, which is usually `rlogind` but names vary, becomes the protocol handler for the session. The network protocol that is used is TCP, so a virtual circuit connection is established between your machine and the remote one. TCP handles flow control and data loss, en-

suring that data sent from one machine appears in the right order and intact on another.

Family ties

When `rlogind` is started, it looks for a spare pseudo terminal. It then forks to create the user process. The child is set up so that its standard in, standard out and error channels all point to the terminal (slave) end of the connection. The parent, `rlogind`, hangs onto the master end. It then settles down to passing characters between the processes running on its machine and the `rlogin` program that you started originally.

The child of `rlogind` that owns the slave end now `execs` to the standard `login` program. There's some magic here about authentication that I am not concerned with at present. Suffice it to say that the startup phase of the `rlogin` session passes your user name, your terminal type and the size of your window from your local machine into the `rlogind` process.

The `rlogind` child will pass your login name into the `login` program as an argument. The `login` program is also given a special flag to permit 'password-less' login, if the authentication has succeeded. When it's started, `login` is convinced that it's talking to a real terminal. After all, its three standard I/O channels are connected to something that behaves like a terminal. All being well, `login` will `exec` to your shell and you are in business.

The `telnet` system does a similar job, except that the protocol used over the connection is somewhat bigger and is intended to be operating system independent. You can `telnet` into many machines, but you can only use `rlogin` into UNIX boxes.

Terminal state

A UNIX process controlling a terminal expects to be able to change the way that many aspects of the communication operates. In basic hardware control for example, setting parity. In control of the code within the terminal driver for data coming in, for example, checking whether a return is altered to a new line; or whether input processing is to be done; or whether one special character means 'delete the last character input'. And finally, in the interface which allows control of the code in the terminal driver on output, for example, whether a tab character is mapped to several spaces.

The main implementation question is: who should be 'in charge' of the terminal state? Consider the `rlogin` example. If a process on the remote machine issues a system call to change some of the terminal state, should the information be passed

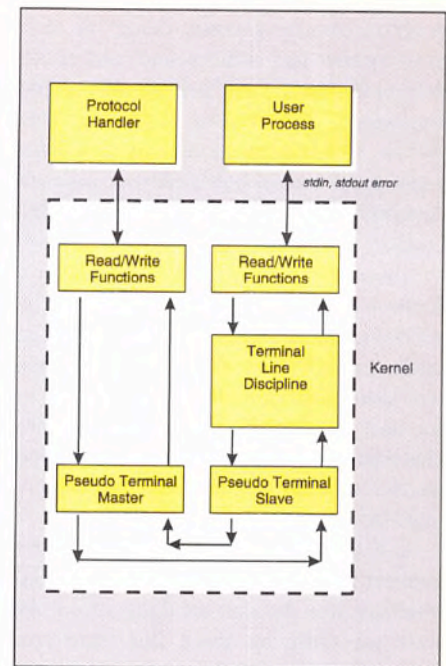


Figure 2 - Original Pseudo Terminal implementation

back to the actual terminal where the user is typing? There are real advantages in doing this. It means that all the line reconstruction, like the handling of the delete character and delete word character, can be done locally on the user's machine, assuming that we are not using character-by-character mode. It also means that character echo can be done locally and will be much faster.

However, it complicates other aspects. Some of the characters that the user types are turned into UNIX signals and we would have to ensure that these signals were turned into messages locally, sent to the remote machine and actioned there.

The original designers of pseudo terminals took what might seem to be the easy way out. They decided that all `ioctl` calls would be handled in the slave end of the pseudo terminal connection.

The `rlogin` program usually splits into two processes, one handling input from the network and one taking data from the user's keyboard. One half of the program just sits there passing every character that it gets from the network onto the user's screen. The other half takes every character that the user types, encapsulates it into a TCP protocol message and transmits it. The local terminal is placed into character-by-character input mode. The local end of the connection just becomes a simple bi-directional byte shifter.

Slave labour

The slave end of the remote connection does all the clever character manipulation that is needed. A single character typed by the user will pass from the local `rlogin`

program, over the network, though the protocol handler and into the slave end of the pseudo terminal. If enabled, echoing of that character is done by the slave side. This makes `rlogin` into something that gives you a good idea of how well your network connection is performing. Every character that you type is being sent over the network in a separate message, and, if echo is on a single message is sent back containing the echoed character. It makes things simpler to implement and also makes the `rlogin` system more platform independent. It's not as bad as it sounds. A host puts out many more characters to your screen than you type which can be handled efficiently by transmitting large chunks of data down the line.

In hindsight, making the slave end of the connection handle this basic character interaction was the correct thing to do. As time has flown by, more and more programs have used character-by-character mode. For example, my current shell allows emacs-style editing of the command line. To do this, it needs to be sent every character that I type at the moment that I type it. My shell doesn't use the terminal interface for line editing any more.

The slave side of the pseudo terminal interface actually ignores much of the terminal state passed from user processes. It

does not have to deal with hardware so all the values pertaining to that side of things are ignored. Terminal speed settings are just stored, except for setting the baud rate to zero, which was traditionally used to hang up the terminal line. Apart from this, things like parity and flow control are just ignored. All the other actions are done locally at the slave end of the connection, and this works with no great fuss.

Confession time

I may have glossed over the truth about `rlogin` somewhat. This daemon uses a special mode, called *packet* mode, on the master end of the connection. Packet mode gives the master some state information about the interface that the slave end is maintaining. Every read from the master end returns a packet preceded by a status byte. This is necessary because the master end must be able to stop output on a Control-S. Packet mode also helps with flushing of buffers back to the local end when an interrupt signal is sent (usually Control-C).

Let's get down to it

The original Berkeley terminal interface consisted of a slab of code that dealt with the system call interface and the gory details of handling the terminal. There were

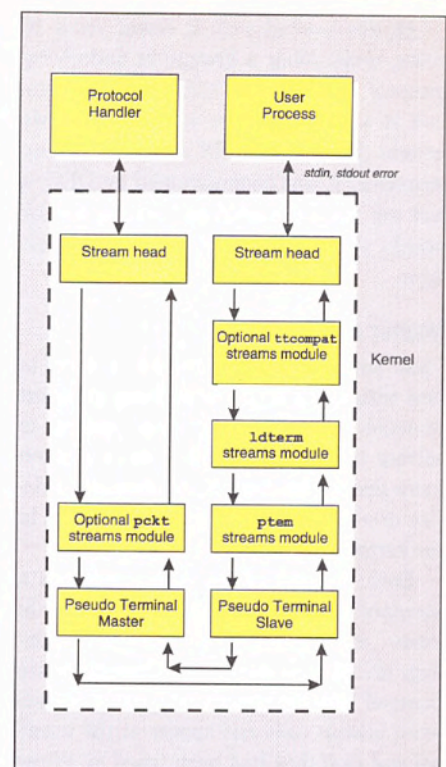


Figure 3 - System V Pseudo Terminal implementation

several different ways of driving the terminal handling code and you selected your preferred style by specifying a *line disci-*

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pline. This was actually a small number that picked a particular set of routines from the available set.

The lowest level of this code talked to a specific device driver that took and received data from the physical device. The pseudo terminal driver was just slotted in at this level. This structure is shown in Figure 2, taken from Richard Stevens' excellent book of which I give details in the bibliography. The boxes represent major software modules.

System V Release 4 handles terminals with streams, an idea that was implemented after Version 7 of BSD and so never made it to the Berkeley systems. Streams allow you to push software modules 'on top of' the basic terminal driver. These modules add functionality onto the basic driver by either modifying the data stream as it passes through in both directions or by intercepting `ioctl` calls to establish state on the interface. To change the behaviour of the interface you 'push' a streams module.

The blocks of kernel code for a pseudo terminal interface are shown in Figure 3, again adapted from the Stevens book. Looking at the right-hand side, the kernel stack starts with an optional `ttcompat` module. This module translates `ioctl` calls supported by Version 7, BSD and Xenix terminal drivers into the more recent style of

interface that is the basis for the POSIX terminal definition. The module is pushed on top of the standard terminal driver, `ldterm`. It's this that drives normal terminals using the POSIX interface. The

All line reconstruction, like the handling of the delete character and delete word character, can be done locally on the users machine.

`ldterm` module sits on top of the pseudo terminal driver, `ptem`. On the master side, there is an optional `pckt` module that turns interaction with the master side into packets as described above.

Got to get one

Pseudo terminals are a general resource that any program can get hold of. Although they were designed for remote terminal access, a great number of programs use them

for on-machine work. If you use X on your machine, then your terminal emulator will run using a pseudo terminal to provide a terminal interface for the shell and subprograms that it runs. If you use an editor like `emacs` or `jove` that permits you to start a terminal session in an editor window, then that session will be supported by a pseudo terminal.

If you don't use X, then maybe you use one of the programs that allows you to start a number of 'virtual' screens from your standard terminal line. These will all be supported by pseudo terminals. Don't confuse this with console virtual screens, which are normally done by a different mechanism. Finally, there are programs like `script`. `Script` records a terminal session in a file by using a pseudo terminal.

It does not take privileged access to obtain a pseudo terminal. Most systems permit mortals to get hold of them easily. On a BSD system, there are several entries like `pty0` sitting in the `/dev` directory. The strategy is to start at `pty0` and attempt to open the device. This will succeed if a device is not in use and will fail otherwise. If this fails, the next name is derived by incrementing the last value from zero to 'f'. If that fails, the penultimate character is cycled from 'p' to 'z', and then from 'P' to 'T'. On

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my system, I have 48 pseudo terminals, whose master names start at `pty0` and end at `ptyrf`.

Once a free pseudo terminal is found and opened, the name of the slave side is computed by changing the leading 'p' into 't'. So the slave program ends up using a terminal name like `ttyq3`.

Mine, all mine...

Ownership of the device pair can be a problem on a BSD system. To allow anyone to access the resources, you'll find that the devices are usually owned by root and are read/write to everyone. You can use them like this.

However, if you are worried about someone sending characters to your terminal then you will want to change the access mode to be more restrictive. You will also want to own the terminal, so that you can run a command like `mesg` that changes the mode of the slave end of the device.

In general, this means that programs that deal with pseudo terminals are `setuid` to root so that they can create the correct ownership and permissions on the terminal. Usually, the protocol manager code is owned by the superuser and the user process has its ownership changed appropriately. However, it does mean that mortals can find it hard to write secure programs that access pseudo terminals.

All systems go

The System V implementation came much later than the Berkeley one and the designers could see some of the pitfalls in the original setup. First, to open a pseudo terminal under System V release 4, you simply open a single 'clone' device (`/dev/ptmx`) that searches internally in the kernel for a free device.

When you open `/dev/ptmx` you are handed a file descriptor and use that to find the name of the slave end that you are dealing with. This is done by passing the file descriptor into a standard routine `ptsname`. The routine sends a message down the master end of the pseudo terminal and is returned a number which can be turned into a name in the device address space (eg `/dev/ptys/66`).

There is another standard routine that copes with the ownership problem, `grantpt`. This executes a `setuid` program which establishes the correct ownership of the device in the file system. It means that programs that use pseudo-terminals no longer require special privilege.

If you look around various systems, you will find various combinations of these two approaches. Some systems have implemented streams and use the standard stream method of driving pseudo terminals

while not implementing the clone device to provide user access.

Get connected


These days, there are probably more connections made into UNIX systems using pseudo terminals than are made from directly connected devices. The original Berkeley approach has proved its worth.

You do have to bear in mind that each connection costs you an extra process for the protocol handler. The data passes between the kernel and user processes twice. I suppose that we take all this for granted, CPU cycles are cheap and hopefully plentiful. ■

Advanced Programming in the UNIX Environment by W. Richard Stevens is published by Addison Wesley. ISBN 0-201-56317-7.

This contains a lot of code that would be useful to anyone who needed to implement a basic pseudo terminal. You can get the sources from ftp.uu.net - or one of its mirrors. Look for stevens.advprog.tar, this may be compressed. Errata to the book can be found in stevens.advprog.errata.

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



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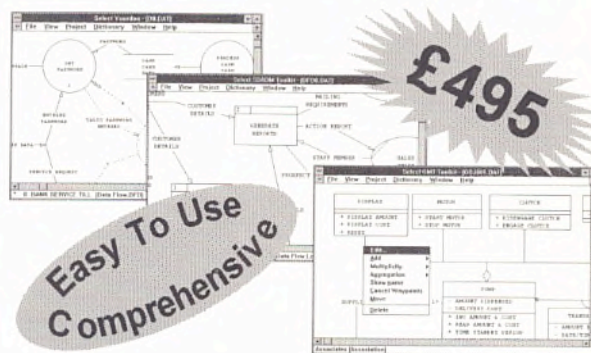
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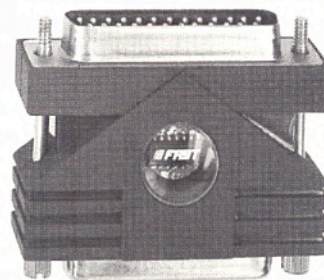
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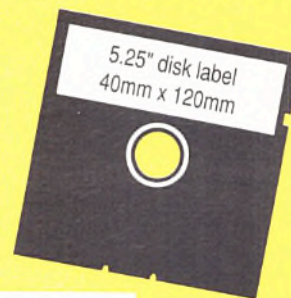
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now that it is in beta.



In the July 1994 issue of EXE I introduced the architecture of OpenDoc. I promised at the time to return to OpenDoc in a future issue, looking deeper inside the workings of this new architecture for the creation of software applications. The OpenDoc betas should have hit the streets during last month so now is the time to take a closer look. I have written a simple OpenDoc part editor for this month's column but don't expect anything too clever. It mostly demonstrates how easy it is to get a basic part editor up and running in a day's work. It illustrates the process of designing and creating software for OpenDoc. This article concentrates on the Macintosh version of OpenDoc, but OpenDoc is a cross-platform product and almost everything you read here can be extrapolated to other OpenDoc platforms such as OS/2 and Windows.

In case you missed the update in EXE last month, the OpenDoc project is approaching completion. Even if a few months later than originally planned, it's on schedule to ship on the Macintosh platform in the late Spring or early Summer of 1995. At the time of writing, a pre-beta version was about to be shipped to Apple developers. The full beta is expected to hit the streets (and be mailed to every Apple developer programme member worldwide) by the time you read this article. The Windows beta is expected about six weeks later.

I am not going to describe the structure of OpenDoc in this article. Rather than repeat myself I'll refer you to the article that starts on page 40 of EXE, July 1994. A few things have changed since then but they are mostly implementation details, not architecture.

Deltas since the alpha

The alpha-6 version of OpenDoc was widely distributed to developers, on both the Macintosh and Windows platforms. All members of Apple's developer programmes received a CD automatically, and almost everyone else who asked Apple or WordPerfect/Novell received a copy. This means that quite a few developers have already worked with OpenDoc and will have to port their code to the final APIs and build procedures present in the beta version. So, what's changed?

The big modification was (on the Macintosh platform) the move from the *Apple*

```
interface ODBaseClipboard :
    ODObjct
{
    ODChangeID GetChangeID();
    void Clear();
    ODStorageUnit
        GetContentStorageUnit();
    void SetPlatformClipboard
        (
            in
                ODPlatformTypeList
typeList
        );
    void ExportClipboard();

#ifdef __PRIVATE__
    void InitBaseClipboard
        (in ODSession session);
#endif

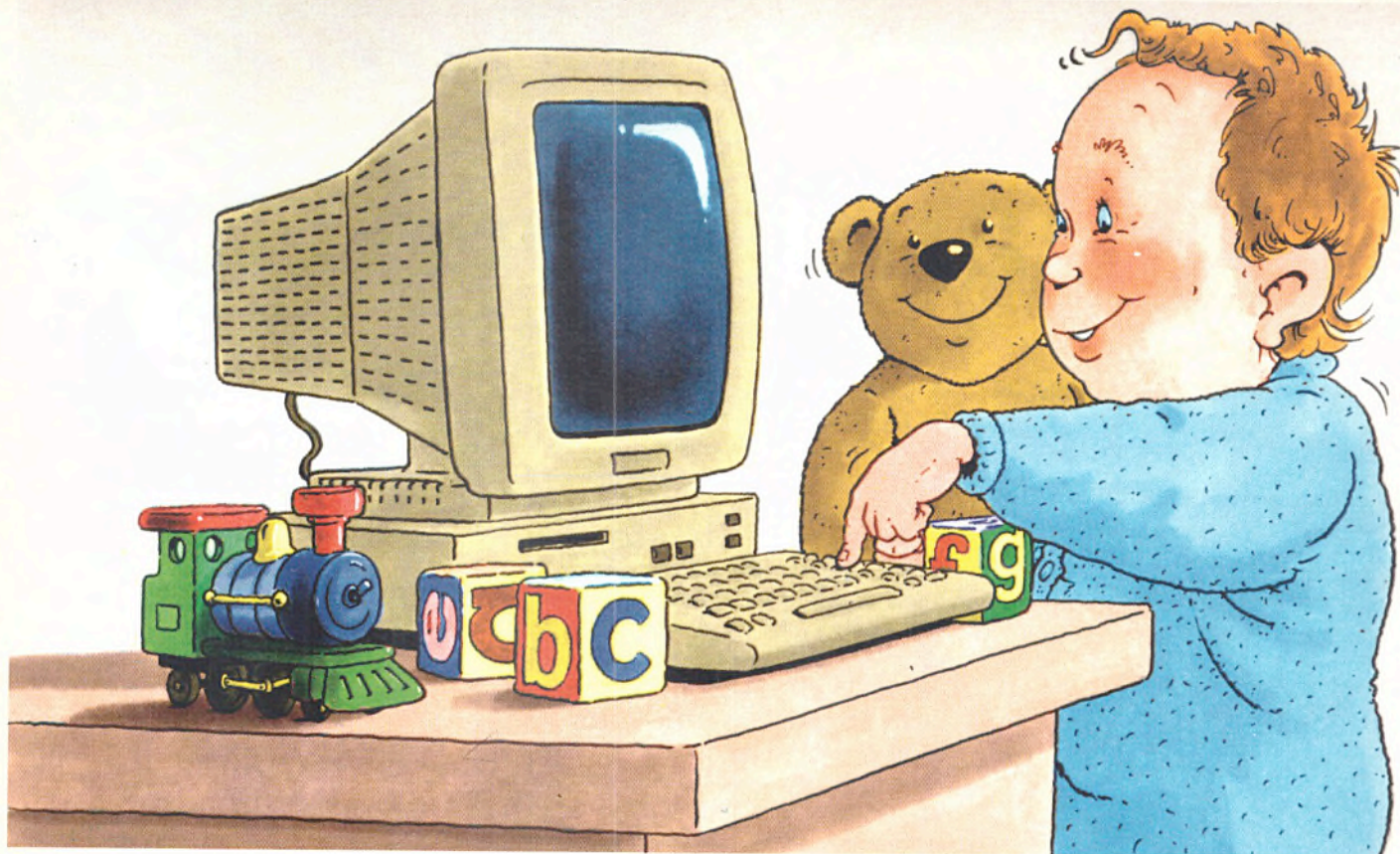
#ifdef __SOMIDL__
    implementation
    {
        functionprefix =
            ODBaseClipboard;
        override:
            somInit,
            somUninit;

        releaseorder:
            GetChangeID,
            Clear,
            GetContentStorageUnit,
            SetPlatformClipboard,
            ExportClipboard,
#ifdef __PRIVATE__
            InitBaseClipboard;
#else
            reserved1;
#endif
    };
    majorversion = 1;
    minorversion = 0;
};
#endif
};
```

Figure 1 - Class definition written using IDL

Shared Library Manager (ASLM) to IBM's System Object Model (SOM). This also involved a change to the underlying object

OpenDoc does most of
the work. All you have to
do is fill in some
partspecific behaviour
in your part's code



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model of OpenDoc. The alpha version of OpenDoc was defined as C++ classes. It was constructed using platform-specific dynamic linked library mechanisms such as ASLM on the Macintosh and DLLs on Windows. The OpenDoc beta uses SOM on all platforms. The classes are defined using SOM *Interface Definition Language* (IDL).

Unlike ASLM and Windows DLLs, SOM itself is a language and compiler neutral platform independent object model. As such, OpenDoc does not make use of C++ features such as multiple inheritance. The OpenDoc APIs are no longer tied to C++. This means that bindings for other languages (Object Cobol for anyone?) are feasible. Class definitions are in .idl header files, which look a little like C++. An example OpenDoc class definition, written using IDL, is shown in Figure 1. The .idl files are converted, during the OpenDoc build process, into C++ by an IDL compiler tool. But you won't need to do this unless you are creating an OpenDoc extension, or unless your part editor is unusual. The beta IDL compiler is packaged as an MPW tool and emits headers for C and C++, together with a private stub implementation file and a private implementation header file for C++. You won't need to do much with these except include them in your part editor's build process, and `#include` the header file in your project's source files. You won't want to study these synthesised files too hard as IDL is a lot easier to read.

Part editors are packaged, on the Macintosh, as *Code Fragment Manager* (CFM) library files. They are loaded under the control of SOM. A part editor is defined as a subclass of the SOM class `ODPart`, in SOM. Apple recommends using a 'wrapper' class to delegate from the IDL-defined SOM part editor subclass to your own C++ class. This allows you to make changes to your class and to dovetail in existing code, without ever having to dive into the IDL. The OpenDoc beta includes a tool called *PartMaker* that automatically does all the work, creating the IDL files, the public and private C++ header files and implementation files. All you have to do is add your own private instance variables and functions and 'fill in the blanks' in the public implementation file. More on this below...

SOM allows objects to be distributed, using what was called DSOM. Since there was some confusion between SOM working between different address spaces on the same machine (the original DSOM) and SOM working between stations, IBM decided to drop the name DSOM. So now there's only SOM. The OpenDoc APIs take this into account by providing *factory* methods of related objects that your part editor should

```
void CPScriptWizardPart::Externalize(Environment* ev)
{
    if (fDirty != kODFalse)
    {
        Handle h = kODNULL;

        if (fSWInitialised && fTEh)
            h = (*fTEh)-hText;
        else if (fOldScriptText)
            h = fOldScriptText;
        else if (fNewScriptText)
            h = fNewScriptText;

        ODStorageUnit* storageUnit = fPartWrapper-GetStorageUnit(ev);
        // Get the reference to where we are writing to.

        storageUnit-Focus(ev, kODPropContents, kODPosSame,

            // First we focus on the property we want to write out.

        if (h != kODNULL)
        {
            char          textState = HGetState(h);
            ODLockHandle((ODHandle) h);

            storageUnit-SetValue(ev, GetHandleSize(h), (ODValue)*h);
            // Now we write out the property.

            HSetState(h, textState);
        }
        else
        {
            storageUnit-SetValue(ev, 0, (ODValue)kODNULL);
            // remove old data
        }
        fDirty = kODFalse;
        // Flag our part as no longer being dirty.
    }
}
```

Figure 5 - 'Externalize' function

use to create new SOM objects. This allows objects to be created on the most appropriate machines. The factory method of the related object will take care of the details.

Other changes in the betas include increased use of reference counting and a global change to the naming conventions. In the alpha, all constants, types, classes, and file names were prefixed with `XMP`. This referred to *Exemplar* an obsolete code-name for OpenDoc. In the beta, all these names use the prefix `OD`.

Part writing, part making

Creating a new OpenDoc *Hello World* part editor is very easy. You don't need to know as much about the Macintosh toolbox as you do to write a complete program. Apple has provided a tool called *PartMaker* that creates all the required project files for a

new part editor. All you have to do is build it and it will run. *PartMaker* works by reading a definitions' document and emitting all the header, implementation, and project/make files that are needed to define the shell of the part editor. *PartMaker* templates for C++ and C part editors are included with the OpenDoc beta. Of course, the part editor you create with *PartMaker* doesn't actually know anything about the type of content you want it to deal with. It's up to you to add the necessary behaviour.

An OpenDoc part editor is, from OpenDoc's point of view, an instantiation of the class `ODPart` stored in a *Code Fragment Manager* (CFM) library. *PartMaker* creates this as a *part wrapper* (see above) which calls member functions of a C++ class, or C functions, depending on whether you had *PartMaker* create a C++ or a C project. The

part wrapper calls these functions when messages are received from OpenDoc. PartMaker fills out the code with some default behaviour, but it's up to you to write the code that handles the content specific to your part editor. To implement a basic part editor all you need to do is add the code to

- draw the part
- store and retrieve the part's data
- activate the part
- and handle events (mouse clicks, keystrokes, etc.) sent to the part.

Any non-trivial part will need some additional user interface, outside the confines of the part's frame. A small amount of code must be implemented to register menu items and handle menu events. A little more is required to manage windows and to display dialog windows and to show tool palette windows if required.

If you want your part to be able to embed other parts, you have to add a little more behaviour to cope with embedding frames, creating facets for visible frames and storing frames. You might also want to support other facilities such as drag and drop, asynchronous drawing and scriptability. In each case it is not necessary for you to provide a lot of architecture and plumbing to support these features. OpenDoc does most of the work. All you have to do is fill in some part-specific behaviour in your part's code.

If you are converting an existing program to OpenDoc, you have two possible routes. You can convert it to a part (or parts, by breaking it up) or, if you are in a hurry you can use a library called *CALib* that will help your program embed OpenDoc parts. At the time of writing, I had not seen *CALib*, but I understand that it will be as easy to embed OpenDoc parts in your program's windows using *CALib*, as it is to embed QuickTime movies. In other words, not too hard. Some documentation for *CALib* is on the pre-beta seed of Macintosh OpenDoc, together with an email address to request more information. Apple's MacApp 3.5 framework will use *CALib* to support the embedding of OpenDoc parts, so MacApp users will get the benefits for free.

A part editor in one day and half!

I thought it would be neat to write a sample part editor for this article. I set aside a day and a half for the project. Of course, it's not feasible to create a complex program, such as an OpenDoc part editor, in such a short time. So I decided to build something a bit less ambitious, a simple text editor that could accept inbound drag and drop operations (to demonstrate integration with other text parts). The editor would allow the user to compile and run scripts by means of an

```
void CPScriptWizardPart::RunScript(Environment* ev)
{
    if (fSWInitialised && fTEh)
    {
        AEDesc sourceDesc;
        sourceDesc.descriptorType = typeChar;
        sourceDesc.dataHandle = (*fTEh)-hText;
        //HandToHand(&sourceDesc.dataHandle);

        AppleEvent          theEvent, theReply;
        SWAE_MakeAppleEvent('misc', 'dosc', &theEvent);
        AEPutParamDesc(&theEvent, keyDirectObject, &sourceDesc);

        if (AESend(&theEvent, &theReply, kAEWaitReply,
                  kAENormalPriority, kAEDefaultTimeout,
                  kODNULL, kODNULL) == 0)
        {
            AEDisposeDesc(&theEvent);
            AEDisposeDesc(&theReply);
        }
    }
}
```

Figure 6 - 'RunScript' function

Apple event link to a copy of ScriptWizard 1.1 used as an 'OSA server'.

The first step was to use PartMaker to create the C++ shell of the sample part. This took about a minute. The output was a project to be compiled using Metrowerks CodeWarrior (see Figure 3 for a screen shot). In the pre-beta version of OpenDoc, CodeWarrior is the only supported development environment, although Symantec's and Apple's MPW-based compilers will also be usable in the near future. Building the part editor using CodeWarrior was very quick: I am used to MacApp MPW builds taking 10 minutes, or more. With CodeWarrior, on a Quadra 650 with PowerPC upgrade card (equivalent to a Power Macintosh 7100/66), the full build takes less than a minute.

The source code generated by PartMaker compiles to create a part that displays a simple graphic in a non-rectangular frame (thus neatly demonstrating how OpenDoc supports non-rectangular parts). My first task was to remove the sample drawing code from the `CPScriptWizardPart::Draw` function, and make the frame a simple rectangle by modifying the `CPScriptWizardPart::MyGetUsedShape` function.

The next job was to prepare the `CPScriptWizardPart` class to manage its own content type. Since the part was to be a simple text editor (amongst other things) I declared a `TEHandle` instance variable to hold a handle to the text edit record. Next it was necessary to add routines to create and dispose of the `TEHandle`, called at the times when the part's facet was

created and disposed of (when the part editor receives, respectively, `FacetAdded` and `FacetRemoved` messages). For the sake of simplicity the text edit record is initialised to fill the facet without having any scroll bars. A more advanced text editor would probably handle this a bit differently.

To display the content of the text edit record required only a small amount of extra code in the `CPScriptWizardPart::Draw` function. I just added a call to `TEUpdate` and a check to make sure the text edit record was initialised. Likewise, responding to keyboard events (to allow typing), following the receipt of `keyDown` and `autoKey` events, required only the addition of code to *focus* the drawing engine on the part and then call `TEKey` to process the event.

Text Edit needs to receive idle-time in order to blink the caret that shows the user where new typing will appear. To make this happen, the ScriptWizard part calls the OpenDoc Dispatcher object's `RegisterIdle` function after creating the text edit record. This asks OpenDoc to send periodic *idle* events to the part. On receipt of these, the part calls the `TEIdle` routine. Having added all the above code, the part accepted new typing, was able to redraw itself and was able to blink the caret. The next thing to do was to add support for handling mouse clicks in the part's content area, so the user could select and deselect text. This was simply a matter of focusing and calling the `TEClick` routine whenever a `mouseDown` event was received. If we wanted to support drags out of the text editor there would be a bit more work to do.

My next task was to make the text entered in the part persist, by storing it in the OpenDoc storage system. When OpenDoc wants a part to store its contents, it sends the `Externalize` message to the part. The ScriptWizard part's source code for handling the `Externalize` message is shown in Figure 2. It works by focusing on the part's storage unit and writing the data to it. The sample code here only writes one type of data, but OpenDoc encourages a part to store multiple representations of data so that other part editors can read it. The converse requirement, that of reading the data back in, is handled in response to the `InitPartFromStorage` message.

The ScriptWizard part displays its own menu bar, containing commands for compiling and running the script that has been entered in the text editor. In order to make OpenDoc recognise the commands in this menu bar, the OpenDoc function `RegisterCommand` is called, from the part's global initialisation function `::MyCommonInitPart`, to bind command numbers to the menu items. This allows the part's function `::MyHandleMenuEvent` to identify and handle the commands. The run script and check syntax (compile script) commands are handled by taking a copy of the text from the text edit record and sending it

in an Apple event to the Script Wizard program. The code that handles this is in the function `::RunScript`, shown in Figure 3.

The last thing I had to do was implement drag and drop support. OpenDoc really does make this very easy indeed. All one

OpenDoc does most of the work. All you have to do is fill in some part-specific behaviour.

has to do, to accept drags, is to implement the `::DragEnter`, `::DragWithin`, `::DragLeave`, and `::Drop` functions of the part's class. The first is called when an incoming drag needs to know whether the part would be able to accept it; the second while the cursor is still over the part, the third when the cursor leaves the part without dropping, and the fourth if the drop is really taking place. PartMaker, by default, puts these functions into the C++ part's unimplemented stub so you just need to move them back into the part itself. The only hard

thing, for me, was remembering to call the frame's `SetDroppable` function. Unless this is done, OpenDoc will not allow dropping in the frame.

OpenDoc for every programs?

OpenDoc is designed as a compact set of APIs. It is structured in a fashion that should make it easy for existing programs to become part containers and not too hard for existing content types to be edited within OpenDoc parts. In spite of all this, programming for OpenDoc does involve a paradigm shift and a new programming model.

Rather than print all the source code for the ScriptWizard part in EXE, we've arranged for it to be made available on request. Send an SAE and a blank diskette (3.5-inch HD) to the EXE editorial offices, in an envelope marked 'OpenDoc'.

Paul G Smith provides technical and team-management services and 'mentoring' through the Commstalk consultancy. He was lead developer of Macintosh software products including Commstalk-4D and ScriptWizard. He can be reached by electronic mail at paul@ctalk.exnet.com, and by telephone at (01727) 844232.

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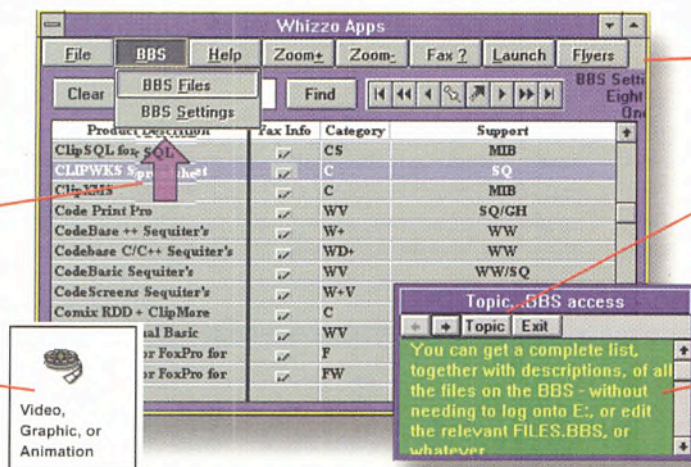
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Letters

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.

Classic analogy

Dear EXE

I enjoyed reading your Comment section [EXE January 1995, p.3] and your conclusions may be right, but your analogy is superficial. Looking deeper into this subject, I find that it tells you more if you take into account better information about classical music...

If you ask practising musicians how they play, they will tell you that they train their bodies to perform complex tasks almost automatically and that both their bodies and their minds participate in reproducing a piece of music in performance. In many cases, the eyes are not 'trained on the sheet music', as the music has been learnt. The music is there as an aide-memoire.

It is far from the case that basic information like tempos are accurate, as there are contemporary accounts of music in Mozart and Beethoven's times that cast serious doubt on even the speed of subjective terms and on the metronome marks that were added by the composer later. In fact, music is interpreted through a huge, changing, received understanding of the meaning of the notation. You only have to look at the differences in performance over the time that we have recordings to see that the notation has been subject to different interpretations.

It is also not true that we have a perfect notation. Scholars study of musical commentaries such as Couperin's are key to reproducing the techniques and the sounds that were heard. Your pianist, approaching

Couperin now-a-days (playing on a faithful copy of a contemporary harpsichord, tuned to a pitch determined by examining the acoustics of wind instruments of the time and place) is expected to know about these conclusions, because the critics writing in *Gramophone* and similar sources certainly do!

So, I am sorry to say that your analogy as presented is rather simplistic and would be dismissed too easily. But, explore more deeply and we find a more sustainable analogy.

You are saying that music notation is as much as the musician needs to reproduce a piece, given adequate time to practice (which includes learning it) and an understanding of how to perform the music in its correct context. By analogy, a program should be annotated with just enough information to allow the meaning of it to be apparent. It is not possible for the non-programmer to impose simplistic rules about matters such as comments without understanding fully the context and processes the programmer is working in. So we would expect to find either comments in the code or volumes on the virtual bookshelf, describing the context. We would expect to find a body of received practice, such as the many tutorial books, sample programs and other resources. There would be industry practises, like Hungarian notation for C, which would be treated as 'givens'. We would expect to find the peer review (the programmer's equivalent of a review in *Gramophone*, perhaps).

I think that you have made a plea for programming standards to be based on pragmatic programming needs and those can only be determined by motivated programmers. Motivation implies that these programmers are also committed to communicating to the future and probably are themselves deeply immersed in quality matters.

And that leads me to the core of the matter. Too many programmers, not only when writing sample code for publication, but also in detailed implementation code, do not seek to communicate. Composers communicate over two, three, four or more centuries because they are as concerned to communicate with the performer as to create the actual music. ...Too many of our present programmers think it is a 'write once' activity and that's the excuse for the com-

ment counters and other varieties of Thought Police.

But, please, light-weight analogies that can be discounted easily do not help us arrive at the truth of the matter, or spread the word.

Peter Whitham

pgbw@cix.compulink.co.uk

I agree that reproducing a piece of music entails practising the numerous phrases that make the composition. Obviously there is the physical training, the mastery of the instrument. At one level the skill of the concert pianist lies in her ability to play the instrument. The more she practices, the better she will become, in the same way that improving familiarity of our own instruments of software development will lead to increased productivity.

But the article did not concern the level of competence required as a prerequisite to using programming tools: that would make the subject of a completely different article. Instead I scrutinised the act of programming itself. What I had in mind when I suggested the pianist would have her eyes trained on the music she played was that she would be 'sight reading'. She would be interpreting the music as it was written on the page, just as a developer would peruse the listing of a colleague and be able to understand the inner workings of the program.

Music is not a perfect notation. But through centuries of evolution it has grown into a concise symbolic language which transcends linguistic barriers. As a nation we lack proficiency in the national languages of our European neighbours. How easily can we read the comments in their source code, or can they with ours?

Cliff Saran, Editor, EXE.

Letter of the Month

The writer of the best letter of the month, as judged by the Editor, will receive a £30 book voucher, courtesy of PC Bookshop, 21 Sicilian Avenue, London WC1A 2QH (071 831 0022). The best letter is the one printed first. Please note that letters submitted to this page may be edited.

Kindly remove your porcupine from my handbag...

The average English father often finds that one of the best things about buying a home computer is being able to lay the blame for this quite considerable expense at the feet of his children. Carefully ignoring the dozen or so games that he has also purchased, he can calmly wave one spuriously educational package in front of his spouse, secure in the knowledge that she understands even less than he does about the malevolent hunk of plastic and silicon that now hogs half the dining room table.

Admittedly, computers do have some learning advantages over the somewhat duller paper and pen. And obviously parents want their children to stretch their intelligence to its full capacity. But the fervent belief that they inspire in so many quarters has always seemed vaguely curious to me.

For example take The Rosetta Stone language learning pack, please. A program which combines pictures, sound and playback facilities to help users learn five different languages. Similar to a book and tape recorder then? Yes, but considerably more expensive. And in keeping with the very best tradition of pocket travel books The Rosetta Stone is equipped with some of the most peculiar phrases. Why anybody would wish to say 'The cowboy is using a rope to catch the calf' in Russian is completely beyond me. But then, the reason for assuming that a computer program should be treated as a glorified book on screen has always eluded me too.

Ctrl

I didn't do nuffink

In his paper *Computer Ethics for Users* Dr Peter S Tippet identifies two common fallacies amongst computer users.

The Nintendo Fallacy is the belief that computers cannot let their users cheat, or do anything wrong/immoral.

The Samsonite Fallacy is the belief that users cannot harm anything or anyone in the real world by messing about on other people's computers.

Tippet's explanation for these quite extraordinary beliefs is the lack of 'sand box training'. He points out that computer users today very rarely have parents who also used computers, so parental and societal pressure to use computer responsibly is missing.

Let's face it, most computer users gleaned their first impressions of information technology from watching early issues of *Doctor Who*. To a certain extent it's no wonder that so many people have such unrealistic expectations.

For more information on The National Computer Ethics & Responsibilities Campaign email ptippet@symantec.com

Love me tender

You can't keep that ol' romantic spirit down at EXE Towers, no sirree. When we're not cracking the latest, tightest code we're skipping amongst the flowers, gazing at the moon and dreaming of our loved ones. Which is why we gave you the opportunity last year to send your Valentine a free copy of EXE. Not suprisingly, you answered in droves: what price Interflora when EXE is on offer? And now that it's that fluffy-bunny-wunny time of year again we thought we'd offer a selection of the very finest Valentine's messages from EXE readers. Milton eat your heart out.

You make my front end go all GUI
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Here's some more toilet paper

(Editorial note: we know where you live matey. So just watch it!)

WIN ACCESS DEVELOPERS BUNDLE !

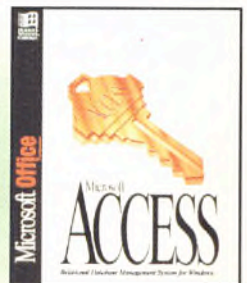
A bumper-bundle of Microsoft Access, Access Solutions, Access Toolkit and Access Training Videos, worth £700, is up for grabs in this month's competition.

To enter, simply answer the question below:

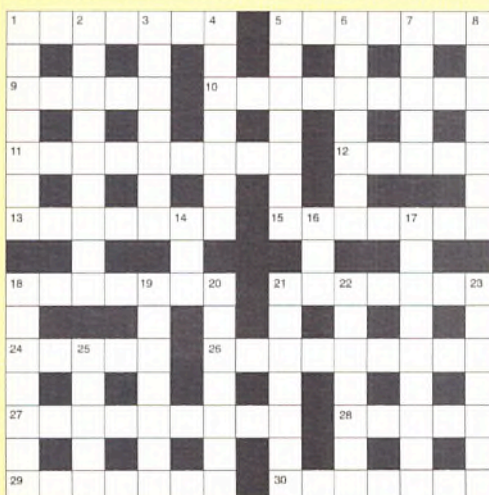
How many copies of Access have been sold in the UK since it's launch?

- (a) 250,000
- (b) 1,350,000
- (c) 3,000,000

Send your details to us at the address on the top of the right page. The first correct entry to be drawn from our hat will win this superb stack of goodies.



PRIZE CROSSWORD



ACROSS

1. Rules for pub used with 18 down? (7)
5. Time for clothes? IT's rubbish (7)
9. Be the best in stout documentation (5)
10. Inability to handle a record maybe (4,5)
11. Shine on the virgin chip for instance (9)
12. Add 'em up quickly with a symbol (5)
13. Flits south-east for a move, but suffocates (7)
15. Geometrical (geographical?) chunks of disk space (7)
18. Similar part of a storage sphere? (7)
21. Chunk of code produced by habit perhaps (7)
24. Disdainful about aluminium object-oriented function? (5)
26. Store without delay (9)
27. Broken up unlike a football team (3,6)
28. Discharged in a curve (5)
29. Batter's moment when the program starts to work (3,4)
30. Rare person quite untouched by IT? (3,4)

DOWN

1. Organic electronics presumably (7)
2. Coming back to press <ENTER> (9)
3. Ring, empty, aluminium, is egg-shaped (7)
4. Makes loving lobes (7)
5. Collects data like rosebuds (7)
6. Like an automaton, one with a chip (7)
7. Give up the Australian native with a radio phone (5)
8. As you were, Inuit (7)

14. Age in the only suitable place (3)
16. For instance nothing makes me me (3)
17. I char logs made for the few rulers (9)
18. Ottoman Sir (7)
20. Scottish symbol hits LET badly (7)
21. Fast time with Armada broken up before night starts (7)
22. As graphic held only as a set of points? (7)
23. One who makes changes in the Yemen Derby (7)
25. Frequently in the soft encoder (5)

Solutions to January's crossword.

ACROSS: 1. IMMEDIATE ACCESS 9. LILAC 10. CAN INSTAL 11. GARBAGE 12. ISRAELI 13. LUCRE 15. YODELLING 17. NEEDINESS 19. GATES 21. UNKNOWN 23. LINKAGE 25. HEINOUSLY 26. RANGE 27. SYSTEMS ANALYSIS

DOWN: 1. ILLEGAL 2. MYLAR 3. DECLARE 4. ARCHETYPE 5. ENNUI 6. CENTRAL 7. EXTREMIST 8. SELLING 14. CHECK BITS 16. DISPLAY ON 17. NOUGHTS 18. ISOTOPE 19. GENERAL 20. SEEKERS 22. NESTS 24. AUNTS.

This month's crossword prize is **OS/2 Warp**. The winner of December's crossword is H.M. McFarlane, who wins the Oxford Compendium on CD-ROM. Please send in your entries to the address on the top of the next page.

Break

Please send your rants, raves and competition entries to:

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

Coming soon (we hope)

So Bill Gates now has a regular fortnightly column in the Guardian tabloid section. So kind of him to start off with a few hints and tips for any aspiring multi-millionaires out there. Ctrl/Break scoured the page eagerly for the secret to world domination but was disappointed to learn that Bill doubts the appearance of another Microsoft. Well obviously not. It takes a certain flair to keep bringing out the same product with the same bugs every year. Not everyone would be up to the task.

By now you will have probably read that Windows 95 has slipped back to August. Rumours that the Guardian was hastily planning to rename the column Bill Gates 96 are, of course, completely unfounded.

Brion and Betty

by Neil Kerber



Maybe not today, maybe not tomorrow...

There can't be many of you who haven't read the 'Microsoft to Acquire the Roman Catholic Church' spoof news release on the Net by now. This highly amusing narrative tells of Microsoft gaining exclusive electronic rights to the Bible and the Vatican's art collection, whilst Gates develops the religious software division strategy 'a single core religion to be offered with a choice of interfaces according to the religion desired'.

Apparently the number of emailed complaints forced Microsoft to issue a denial. Do you find this surprising? One national newspaper did. Maybe we should bare in mind that there's a limit to the number of things you can spend millions of pounds on. And there are only so many places you can go after you've conquered the software market. Keep a tight grip on that funny hat John Paul.



EXE
The Software Developers' Magazine

SUBSCRIBERS CLUB

This month sees the launch of the EXE Book Club page. Turn over for the finest selection of offers on the latest most essential reads.

The EXE Software Developers Challenge 1995



Hot foot it down to Sandown Park racing track next week for the Software Developer's Forum on the 8th and 9th of February. EXE will be hosting the 1995 Software Developers Challenge on February 8th. 25 teams will battle to develop the killer app for the Royal National Institute for the Blind.

Not only will the winners be rewarded with the knowledge that they have helped out one of the country's most prestigious charities. They will also be jetting off to America to compete in the world Software Developers Challenge 1995.

Don't miss this exciting opportunity to watch the country's best development teams in action and meet the EXE team.

EXE Compiler Report

Turn to page 33 for the third part of our C++ Compiler report. Two more detailed versions are also available. The Technical Version costs £35. The Management Version (including full managerial reports) costs £75. EXE subscribers get a further 10% discount.

The Windows 95 Show

This promises to be the biggest event of the year with over 60,000 attendees. Will this be the launch of Chicago/Windows 95 or just another beta? Don't forget to come along and say hello to your friendly EXE team. Fun, frolics and £5,000 worth of Microsoft software to be won.

Game Competition

Galactic Civilizations was the first commercially available game for OS/2 WARP. It shot to number one on the Net PC Games Top 100 over Christmas, knocking Doom and Doom 2 to second and third places. We have five copies of Galactic Civilizations to give away. See whether you agree with the Net's most avid gamers. Send your name, address and reader number on a postcard. First five copies out of the bag at the end of the month win.

Free Book!

Hackers: Heroes of the computer revolution by Steven Levy. Published by Penguin. ISBN 0-14-023269-9.

This book tells the tale of the original computer 'hackers' of the 50s, 60s and 70s amongst them Steve Wozniak and Bill Gates. Fascinating and funny it gives an insight into the early lives and computer loves of the industry's founders. Send your name, address and reader number on a postcard. First five copies out



Good News for Bookworms

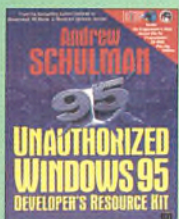
Welcome to The Book Page. It's new. This EXE Subscriber Club initiative will feature in the magazine every month and enable you to get great techie books at up to 25% cheaper than shop prices. We kick off with these seven top sellers and will build up a superb selection in the months ahead. To take advantage of these fab deals, please quote your Reader Number when ordering.



Heavy Metal OLE 2.0 Programming
by Steve Holzner
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Now OLE 2.0 programmers can learn how to make applications that are easy to use, document-centric and OLE aware. Comes with a free Heavy Metal disk with source code and working programs.



Unauthorised Windows 95 Developers Resource Kit
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The ultimate book for anyone interested in Windows 95. Andrew Schulman provides the first critical and realistic look at what "Chicago" means for the software industry. Find out answers to tough questions. Is DOS dead? Is Windows 95 a completed integrated operating system? Is Windows '95 just Win32's? In addition, receive free *The Programmers Shop Smash Hits CD-ROM* and Schulman's *Spy Utilities* disk.



Free Stuff from the Internet
by Patrick Vincent
457 pages

Normal Price: £18.99
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ORACLE Performance Tuning
by Peter Corrigan and Mark Gurry.
642 pages

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The most popular RDBMS in use today. This book shows you the many things you can do to increase the performance of your existing ORACLE System, whether you are running Version 6 or 7.



TCP/IP Network Administration
by Craig Hunt
502 pages

Normal Price: £22.00
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A complete guide to setting up and running a TCP/IP network for practising system administrators. This book covers setting up your network, configuring important network applications including sendmail, and issues in troubleshooting and security. It covers both BSD and System V TCP/IP implementations.



sendmail
by Bryan Costales
830 pages

Normal Price: £24.50
Price to You: £18.40

Although sendmail is used on almost every UNIX system, it's one of the last great uncharted territories - and most difficult utilities to learn - in UNIX system administration. This book provides a complete sendmail tutorial, plus extensive reference material. It covers the BSD, UIUC IDA and V8 versions of sendmail.



UNIX in a Nutshell
SystemV Edition
by Daniel Gilly & O'Reilly staff
444 pages

Normal Price: £7.50
Price to You: £5.60

You may have seen UNIX quick reference guides, but you've never seen anything like UNIX in a Nutshell. Not a scaled-down quick reference of common commands, this is a complete reference containing all commands and options, along with generous descriptions and examples that put the commands in context. For all the thorniest UNIX problems, this one reference should be all the documentation you need. Covers System V, Releases 3 and 4, and Solaris 2.0

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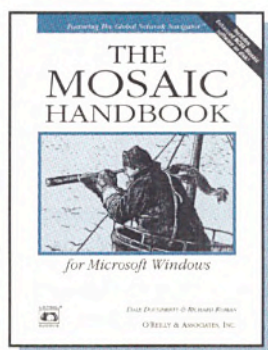
or call Suzanne Chamberlain on 071 287 5000 ext 3414 to place your order.

Mosaic is an important application that is becoming instrumental in the growth of the Internet. These books, created for Microsoft Windows, X, and the Macintosh, introduce you to Mosaic and its use in navigating and finding information on the World Wide Web (WWW).

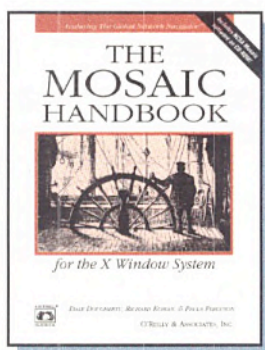
It shows you how to use Mosaic to replace some of the traditional Internet functions like FTP, Gopher, Archie, Veronica, and WAIS. For more advanced users, the books describe how to add external viewers to Mosaic (allowing it to display many additional file types) and how to customize the Mosaic interface, such as screen elements, color, and fonts.

All you need to know about navigating the Internet with Mosaic

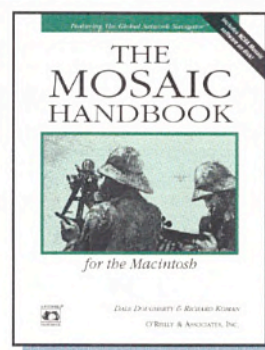
The Microsoft and Macintosh versions come with Enhanced NCSA Mosaic on diskettes; the X Window version comes with NCSA Mosaic on CD-ROM. All three books come with a subscription to The Global Network Navigator (GNN®), the interactive guide that makes the Internet more enjoyable and easier to use. Another new O'Reilly book on a much-requested topic is *Managing Internet Information Services: World Wide Web, Gopher, FTP, and more*. It describes in detail how to set up information services to make them available over the Net. It begins by discussing why a company would want to provide Internet services and how to select which services to provide. Most of the book describes how to set up email services and FTP, Gopher, and World Wide Web servers. This book will be published in December.



Dale Dougherty & Richard Koman
1st Edition October 1994, 230 pages
ISBN 1-56592-094-5. With two diskettes
containing Enhanced NCSA Mosaic
for Windows, V1.0



Dale Dougherty, Richard Koman, & Paula Ferguson
1st Edition October 1994, 288 pages
ISBN 1-56292-095-3. With CD-ROM
containing NCSA Mosaic for the
X Window System, V2.4



By Dale Dougherty & Richard Koman
1st Edition October 1994 198 pages
ISBN 1-56592-096-1. With diskette
containing Enhanced NCSA Mosaic
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➤ CIRCLE NO. 969

Email @ EXE

From local to Internet
wide email for
everyone. **David Mery**
presents a step by step guide.



In the November issue of EXE I described our serial setup. I explained how to share modems with NT to give our LAN users access to the World Wide Web from any machine on the network. Since then the setup has evolved. On the hardware side, the USRobotics modem has been upgraded from V.FC to full V.34 by downloading new firmware from USRobotics' BBS and uploading it to the Flash memory in the modem.

On the software side we have now installed an email capability. Everyone can send and receive local and Internet email. Since MS-Mail was being used before for internal email, all the workstations already had this installed. So we wanted a solution that allowed us to use MS-Mail for Internet email. We found a package called *Dial-up Internet Connection Services* or DICS for short (see Figure 1). It allows everyone at EXE to send and receive Internet email from within MS-Mail through our account on Demon. Microsoft does have an SMTP Gateway in its products range but it didn't fit our requirements on several points. First

it requires a dedicated machine. Second it doesn't support the stack we use and besides, it is also more expensive (£620).

Internet email from MS-Mail

DICS needs an account on MS-Mail called *Internet Relay* with a password which is by default *Internet* but can be changed. When a user wants to send an external email, he sends it with the *To* field set to 'Internet Relay' and the *Subject* field set to the subject followed by the email address, separated by spaces and enclosed in angle brackets. For instance, the subject of a message addressed to `dotexe@cix.compulink.co.uk` would be:

Hello <dotexe@cix.compulink.co.uk>

Incoming external email messages are automatically distributed to the MS-Mail gateway according to an alias file. This file contains correspondence between usernames in our Demon domain name and MS-Mail accounts names. Our domain name on Demon is *DOTEXE* and we use names such as *CLIFFS*, *MELANIEW*, *DMERY*, *EDITORIAL*, etc. Every user has a username composed of their first name followed by the first letter of their last name (with the exception of *DMERY*). We also have a few generic usernames such as *EDITORIAL*. Our alias file is listed in Figure 3. Incoming email messages have a *Subject* field containing the subject and the address of the sender between angle brackets, so it's possible to do a reply on a message.

DICS setup

So that's what's happening on the user side, now let's detail the connection side. DICS was installed in a shared directory on our NT server. The main directory contains the executable files, the *alias* file and one subdirectory, *spool*, which in turn contains three subdirectories: *mail*, *mqueue* and *news*. For those that have used the combination of KA9Q and DIS to connect to Demon under DOS, the directory structure should look familiar. The developer, Mark Gibbons, wrote DICS to be easy to use and upgrade to, for people already connected to Demon under DOS. The installation process even provides an option to upgrade from a previous KA9Q/DIS setup.

The *alias* file is very important. If DICS doesn't find it then all mail is sent with a

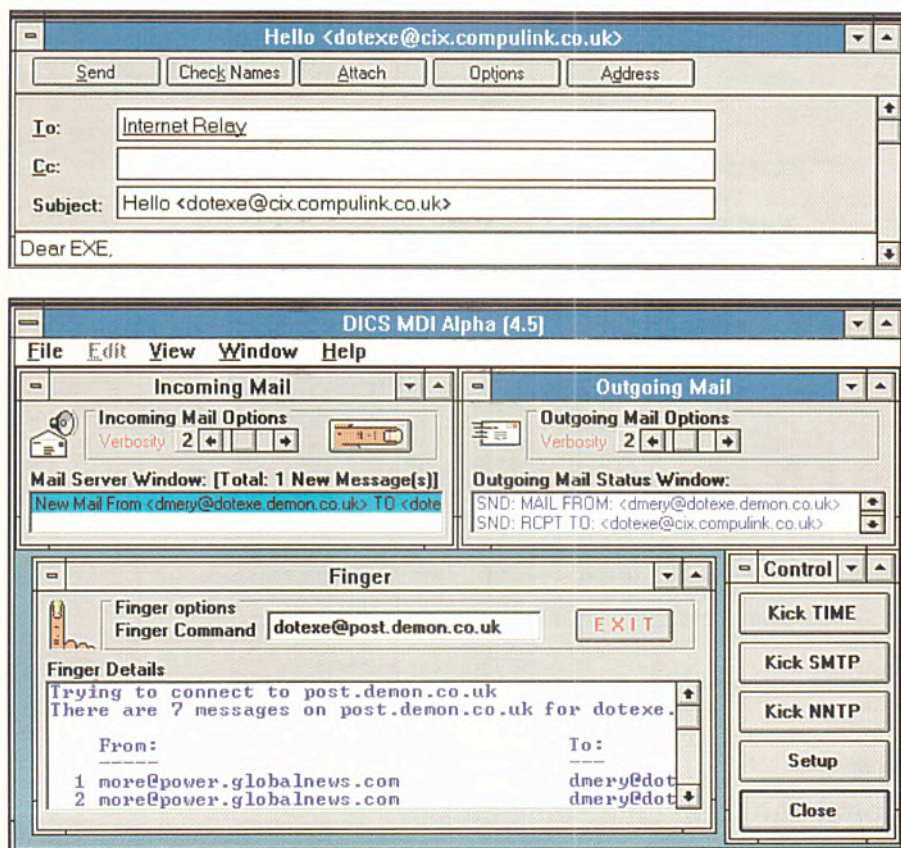


Figure 1 - Preparing a message with MS-Mail and sending it with DICS

From field set to *someone@youraddress*, in our case *someone@dotexe.demon.co.uk*. It happened to us when we were setting up DICS because we didn't set the path correctly in the setup screen (see Figure 2). DICS' setup requires a path for AUTOEXEC.NET for users upgrading from KA9Q. Because we performed a clean installation we didn't fill in this field. In fact it is also used to find the *alias* file.

The *mail* directory is where incoming mail is kept and log files are temporarily stored. For each username a file <USERNAME>.TXT is created where the mail is saved. When it has been transferred to MS-Mail the corresponding file is erased. So if a mail is received for a username not defined in the *alias* file, it is kept in this directory. The *mqueue* directory contains a file called SEQUENCE.SEQ which holds the message number of the next message to be sent. It is used by the MS-Mail MAPI gateway. This directory also holds temporarily outgoing messages. The last directory, *news*, is not used in our setup.

The DICS executable is run only by the editorial team. The rest of EXE don't need to know how the connection works. The only thing they have to worry about is MS-Mail and how to format an address to send external email.

To send all the external mail that is waiting on MS-Mail and receive mail sitting on Demon we simply launch DICS. When executed, DICS in turn launches Trumpet Winsock which connects to Demon. From then on everything is automatic. DICS includes a Finger command which is automatically set to *dotexe@post.demon.co.uk* in order for us to check if there's any mail waiting.

If you remember the article in our November issue you'll know that the connection is in fact a little more complicated than

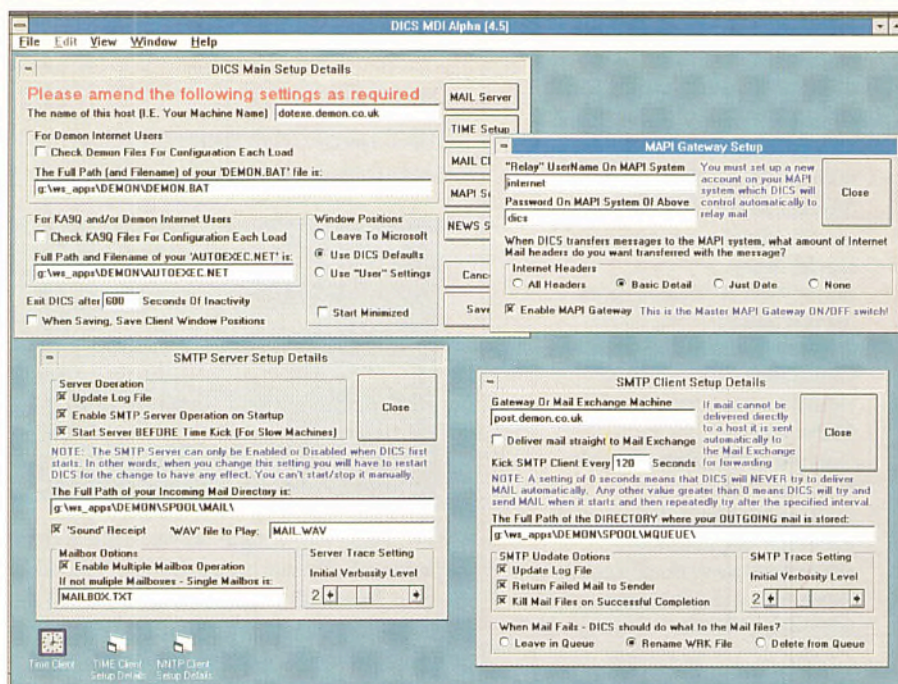


Figure 2 - Setup of a few components of DICS

that. The connection is not direct from Winsock. The stack accesses one of the two available modems through SAPS, an NT serial port sharing software, but that bit is completely transparent.

In DICS two verbosity levels can be set. One concerns the amount of header information copied in incoming messages. We set this level so that just a minimum header is put in the messages, so users are not saturated with delivery indications. The other one concerns the amount of information displayed by DICS when it is connected to the service provider and is transferring messages. This information is also logged in a file. We fixed this one so that we see the names of the sender and the addressee for each message. It is possible to set it so the

body of every message is also displayed and logged but we think that confidentiality is an important aspect of email which should be respected whenever possible.

Shortcomings

DICS is very robust and does exactly what we need but it has a few limitations. Most are related to the way it's gatewayed to MS-Mail. It's cheap, it works but it's relatively crude. First, email is exchanged with Demon only when we log on with DICS. We tend to do this about three times a day: in the morning, at lunch time and in the evening. Another problem is that the MS-Mail client executing DICS has to be closed before DICS is launched. This is because DICS logs in MS-Mail as the *Internet Relay* user and MS-Mail refuses to have two different mailboxes opened simultaneously on the same computer. If I forget to close my mailbox when I execute DICS then the mail exchange with Demon works but it is not distributed to MS-Mail until the next time DICS is launched.

If a message is sent to a name that doesn't have an alias defined then the message is just saved as a text file with no notification whatsoever. The same thing happens with messages too long for MS-Mail. This is a frequent problem with MIME mail which will need to be decoded by hand. So the mail directory should be checked every now and then.

The last shortcoming is probably the most annoying with regular use. Since DICS works through an MS-Mail account, the address book cannot be used to store email addresses. This must be done in a

```
dmery David_Mery@map
cliffs Cliff_Saran@map
melaniew Melanie_Welsh@map
katea Kate_Adams@map
marcw Marc_Warren@map
stevenm Steven_Miles@map
marcg Marc_Green@map
suzannec Suzanne_Chamberlain@map
sandraip Sandra_Inniss-Palmer@map
editorial Cliff_Saran@map David_Mery@map
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production Melanie_Welsh@map Kate_Adams@map
marketing Suzanne_Chamberlain@map Sandra_Inniss-Palmer@map
awards Cliff_Saran@map David_Mery@map
davidm David_Mery@map
postmaster Cliff_Saran@map David_Mery@map
default deliver
```

Figure 3 - EXE's alias file

Kate Adams

katea@dotexe.demon.co.uk

Suzanne Chamberlain

suzannec@dotexe.demon.co.uk

Marc Green

marcg@dotexe.demon.co.uk

Sandra Inniss-Palmer

sandraip@dotexe.demon.co.uk

David Mery

dmery@dotexe.demon.co.uk

Steven Miles

stevenm@dotexe.demon.co.uk

Cliff Saran

cliffs@dotexe.demon.co.uk

Marc Warren

marcw@dotexe.demon.co.uk

Melanie Welsh

melaniew@dotexe.demon.co.uk

Editorial department

editorial@dotexe.demon.co.uk

Advertising department

advertising@dotexe.demon.co.uk

Production department

production@dotexe.demon.co.uk

Marketing/Promotion dept

marketing@dotexe.demon.co.uk

Figure 4 - EXE's email addresses

text file or whatever small databases using cut and paste from the *Subject* field.

More features

DICS has two other features which were not described above. One is the ability to set the

MS-Mail refuses to have two different mailboxes opened simultaneously on the same computer

PC clock with a time server. This is done automatically and transparently. The other is to download Usenet newsgroups. We are currently not using this feature. To do so requires an external news reader.

Our current setup answers all the needs we had but, of course, it created new ones. As I explained previously DICS is robust but it's limited by the way it is interfaced with MS-Mail and by MS-Mail's own limitations. So our wishlist is concerned more with MS-Mail

itself than DICS. Among the features I would like to see in the future is the ability to use the address book in the mail client for external mail messages, full MIME support and automatic redirection of incoming mail when someone is away... This last point requires more than a simple redirection. That is already possible and is in fact what we're doing for the generic accounts such as *editorial*. What is needed is at least automatic forwarding, possibly to a non local address and automatic generation of a standard reply to warn the sender that their mail may have to wait before it will be read. Even better would be filtering of the subject and/or body of the messages and automatic distribution according to predefined rules...

The latest version of DICS can be downloaded via FTP from ftp.demon.co.uk in the directory /pub/ibmpc/winsock/apps/dics. DICS is shareware and costs £19.95 for an individual machine and £99.95 for a site license (including the use of the MAPI MS-Mail gateway). For more information contact OEM Computer Systems on 01788 570522 or by email at orders@oemcomp.demon.co.uk or orders@oemcomp.com.

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As the market for Object Oriented skills gathers pace we have a number of clients designing systems in diverse application areas including: **Multi-media, DTP, Telephony, LANs, Electronic publishing, On-line information Feeds, Finance and Banking** in both a UNIX and DOS environment.

Positions available vary from traditional Programmer/Software Engineer and Analyst/Programmers to Designers/Senior Software Engineers in the overall strategic direction for end-user organisations.

£17-£35K + benefits

REF: SC/01/EXE

WINDOWS OR X-WINDOWS/BANKING

ALL LEVELS

Three city clients require windows skills at any level. Other relevant skills are SQL server, Transact, SQL, UNIX, VMS or MS-DOS, C, C++, Open Client (DB and Net library), MFC, Open interface and APT. Exposure to analysis, developing user interfaces and rapid development techniques. Full training in Middle Office/Production and Front Office Systems including: Financial and Management Accounting, Treasury, Equity, Fixed Income and Derivatives.

£20-£25K + Banking benefits

REF: SC/02/EXE

C AND C++ PROGRAMMERS

ANALYST PROGRAMMERS

Excellent opportunities exist for bright graduates with one year + experience. Personal background requires a solid understanding of the project life cycle and a commitment to high quality coding. You will be trained in all aspects of Investment Banking, relational databases, 4GLs and Object Oriented Design. A good opportunity for a second career move.

£17-£25K + Banking benefits

REF: SC/03/EXE

SYBASE/INGRES/VMS/C/C++/UNIX

1-3 YEARS £25-£30K + BONUS

Excellent opportunities for Graduates with 1-3 years experience to join a Banking Organisation. Training will be given in the Derivatives/Financial Instruments market. Motivated self-starters who want to take on responsibility in a progressive organisation where skills are rewarded on merit.

OTHER PLATFORMS/DATABASE CONSIDERED.

REF: C/04/EXE

INGRES/ORACLE/SYBASE/GUPTA/OOD AND OOP

ALL LEVELS

Additional experience of: SQL, Forms, C and C++ required. We currently have client companies including Management Consultancies, Systems Houses, Systems Vendors, Bank and Finance clients looking for candidates with: Relational Database design, Database tuning, Systems Administration, DBAs, Pre/Post Sales and solid programming knowledge and expertise. Please call to discuss your particular requirements.

£18-£40K + benefits

REF: SC/05/EXE

C/C++/VISUAL BASIC - UNIX OR MS-DOS

DEVELOPERS

Software House and End Users in Finance, Banking, Manufacturing, Commercial, Scientific and Government application environments require excellent C skills. Both Windows development skills W/3, SDK, NT, X-Windows and Visual Basic or strong C, C++ solid operating systems and good application knowledge are again much in demand. Software development experience is the key, and being able to deliver high performance, high quality, well specified software in competitive time scales. Opportunities vary from small to large software companies involved in expert systems, GUIs, Image Processing, GIS, EIS, Communications, Networking and Object Oriented Databases. Graduates through to senior software engineers/team leaders are required. Please call to discuss.

£14-£35K + Benefits

REF: SC/06/EXE

UNIX/VMS/MS WINDOWS/NT MFC/C/C++

ALL LEVELS

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

£16-£28K

REF: SC/07/EXE

LONDON/HOME COUNTIES WINDOWS SDK/NT DEVELOPMENTS

Senior Development Engineers

To £30K + benefits

Analyst Programmers

To £27K + benefits

Strong programming skills in C or C++ and Windows NT are pre-requisites for these positions. Experience in some of the following areas is also required: MS-DOS 5.0, MS Windows 3.1, Windows NT, Windows SDK, MS C 7.0, MFC, Visual Basic, Visual C++ and Microsoft NT. Also desirable are Windows XVT libraries or networking skills.

REF: SC/08/EXE

SOFTWARE ENGINEERS-SENIOR SOFTWARE ENGINEERS

Various Client/End Users, Software Vendors and Software Houses dedicated to strategic implementation of leading edge technology and integration of applications across different hardware and operating systems platforms require candidates to degree level with a scientific/technical development bias and 1-3 years experience. There are two main options:

TECHNICAL DEVELOPMENT: Continued use of UNIX, VMS, MS-DOS, C, C++, MFC, Windows (SDK, NT or X-Windows and Toolkits), Networking and Communications with companies offering technology based careers and management responsibility.

COMMERCIAL DEVELOPMENT: Using technical based skills already developed, but offering opportunities to apply analysis and design skills rather than remain 'a technical guru' in various environments including finance. Please call to discuss your particular career, growth and potential.

£12-£25K + benefits

REF: SC/09/EXE

VISUAL BASIC SKILLS MUCH IN DEMAND - PLEASE CALL TO DISCUSS

REF: SC/10/EXE

LEEDS - LOW LEVEL C++ WINDOWS COMMS DEV ALL LEVELS

REF: SC/11/EXE

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REF: SC/12/EXE

C, C++/MFC - Countrywide

REF: SC/13/EXE

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SURREY, SOFTWARE ENGINEERS, C/C++, CAD

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£18K to £33K. This very successful designer of Network Products is expanding into NEW markets. They now seek 3 software designers at junior to senior level with at least 2 yrs post graduate experience of Real Time software design of Networks and Operating Systems Internals. Unix and Windows Device Drivers. Good opportunity to advance your career into Product Marketing and/or Management.

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HPUX advantageous	£18,000 + car
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C++, OOA/OOD

Circa £30K

Brilliant new vacancy in Berkshire for an experienced Software Engineer to be fully involved in all aspects of the product design life cycle. You will be working on leading edge network management systems with one of Europe's leading companies. You should be an enthusiastic team player, keen to play a key role within a small team. Good opportunity!

TECHNICAL CONSULTANT

Circa £35K

We are acting as sole agency for a small, growing consultancy and training company based in Bucks. You will be responsible for consulting with customers on integrating client server offerings into client applications. They are seeking a person with 3-5 years experience in any of the following:- C/C++, AIX, HP/UX, OS/2, NT, LAN Mgr, Novell. Please call for info'.

GRAPHICS SOFTWARE (C++)

to £24K

Good vacancy for a young software engineer to work on graphical configuration tool-sets. It will give you the opportunity to be actively involved with WINDOWS 95, NT, and OLE/2. You will report to the project manager and enjoy a high level of autonomy. Ideally you will have a good degree with knowledge of C++, OOD, and Windows (MFC/OWL).

DSP SOFTWARE

£25K

Two established young companies seeking well qualified (2:1 min) Software Engineers to work on the design of new DSP based products. You will be working on exciting imaging and communications projects using C and DSP assembler. For both these companies you will need a good grasp of Maths and have a good analytical brain. Call or write to us for more.

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Young company in Coventry, with a reputation of providing innovative solutions to their requirements, is seeking programmers and analysts with experience in OBJECT ORIENTED techniques, with a good knowledge of Borland C++, and MS WINDOWS SDK. Excellent salaries and benefits. Please call for more details.



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Berks

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ADVERTISERS INDEX

ADVERTISER	PRODUCT/SERVICE	CIRCLE	PAGE	ADVERTISER	PRODUCT/SERVICE	CIRCLE	PAGE
Aladdin	Security Dongles	947	42	Poet	Object Oriented Database	931	11
Bits Per Second	Graphics tools	941	34	Protek	GUI development	938	29
Citadel	Comms library	937	26	Powersoft Europe Ltd	PowerBuilder	970	90
Computer Associates I	Development tools	954	54	Real Techniques & Methods	System Architect	948	44
Contemporary I	Development tools	933	17	QBS I	Development tools	949	46
Contemporary II	Programming tools	943	37	QBS II	Development tools	968	76
Crag Systems	CASE tools	961	68	Rainbow Technologies	Security Products	945	40
DES	Software Protection	966	72	Readmar I	Version Control	929	7
Elverex	Development tools	955	56	Readmar II	Development tools	946	41
Full Moon Software	Code Warrior	967	75	Richfords	Training	930	9
Gemini Consultants	Marketing	960	68	Ridgeway Press	Computer Manuals + Printer	964	70
Geosoft	Map Tools	942	36	Sequiter Ltd	CodeServer	934	18
Grey Matter	Programming tools	927	2	Software Security	Security Dongles	953	53
Great Western Instruments	EasyCASE 4.0	957	62	Softwerk	Development tools	944	38
Hypersoft Europe	Programming tools	952	52	Staria	Telephony	956	58
IEIE Ltd.	Development products	965	70	System Science	Development tools	940	32
Intersolv I	Development tools	932	12	Windows '95	Windows Exhibition	962	66
Intersolv II	Development tools	951	50	Visix Software Ltd	Development tools	926	IFC
John Wiley	Books specialists	963	70	Visual Numerics	Productivity tools	958	62
Nu Mega	Programming tools	959	64	Zachary Software	Visual Objects	935	20
Magnifeye	Software Protection Device	962	69	Zinc	GUI library	939	30
Mason Fox BIU	Development tools	925	5				

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This once in a lifetime event is taking place at the **Software Developers Forum**, 8-9 February 1995 at the Sandown Exhibition & Conference Centre, Esher Surrey.

And all the proceeds are going to the Royal National Insititute for the Blind. So whatever you do, don't leave that exhibition without one, as shame and social degradation will surely follow. And we'll get the lads onto you.



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JOB C/C++/RDBMS/UNIX		JOB 'C'/UNIX		JOB 'C'/UNIX/X-Windows	
LOCATION	SALARY	LOCATION	SALARY	LOCATION	SALARY
London	£16K - £26K	Home Counties	£18K - £32K	Surrey	£18K - £26K
Our client, an energetic and dynamic software house, specialising in multimedia development is searching for a range of Software Engineers with excellent 'C' programming skills under UNIX. Any experience of C++ and RDBMS, in particular Ingres, would be advantageous. This is an excellent opportunity to work in an object oriented environment, but also to work with an emerging technology in an innovative application area. Our client is looking for highly motivated developers to join this growing organisation. REF: EXE/DE/1		High calibre Software Engineers are required by our client, a leader in Open Systems Technology. Suitable candidates will have at least two years 'C' programming experience in a UNIX environment. Knowledge of UNIX operating system development (kernel, utilities), assembler level programming or compiler writing, although not essential, would be advantageous. You will be involved in the development of new products and the support of existing products by investigating problems and creating solutions. REF: EXE/LC/2		This small, British company have recently moved into new premises and are set for major expansion in 1995. They currently require Analyst/Programmers and Senior Analyst/Programmers with at least two years experience programming in 'C' under UNIX. Knowledge and use of either XView and/or Motif, although not essential, will be highly desirable. For the senior positions, there will be opportunities to lead small teams and, for all positions, you will be required to write design specifications for yourself and others to use. REF: EXE/LC/3	
JOB C++ - Train to NT		JOB C++ SYSTEMS DEVELOPERS		JOB Multimedia Developers	
LOCATION	SALARY	LOCATION	SALARY	LOCATION	SALARY
S. Oxon	£18K - £25K	Surrey	To £35K	City	To £30K
A highly successful software engineering company require two Windows, 'C' or C++ developers to join, initially, the Financial Division. With 2-5 years Windows experience and at least a 2nd class honours degree, the successful candidate will work in small teams and will move to Windows NT. The work involves design, development, testing, maintenance and support of the companies products. A knowledge of both spreadsheet techniques and financial markets would be desirable, but is not essential. REF: EXE/FS/4		New development projects within one of Europe's most dynamic and innovative stockbrokers have led to requirements for additional Analyst/Programmers. Candidates must have sound MS Windows, C++ experience. It would be advantageous for candidates to have some financial experience and to have worked under various operating systems such as UNIX or VMS. The IT function is central to the organisation's success, as such, you will work with leading-edge technology with numerous future internal career opportunities. REF: EXE/FS/5		Europe's leading CD-ROM publishing company is seeking to recruit Windows development and testing staff at all levels of experience. They are building teams now to work on a number of new titles to be released into Europe later this year. Ideally, you will have worked in a multimedia environment developing software under either MS Windows or on the Apple Macintosh. Any experience of writing or using graphics software, sound or animation would be useful, but is not essential. REF: EXE/FS/6	

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Windows NT			Testing			Windows/SDK/C		
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REF: EXE/7			REF: EXE/8			REF: EXE/9		

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