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December 1994

# EXE

The Software Developers' Magazine

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New Year  
New Job?  
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## World Programming for Windows

## Mighty C++ compilers under scrutiny

## Best of three Windows report generators



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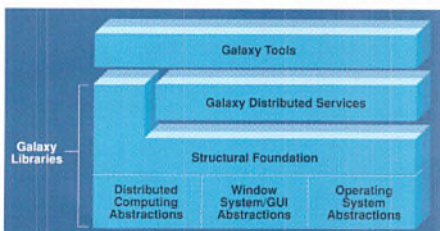
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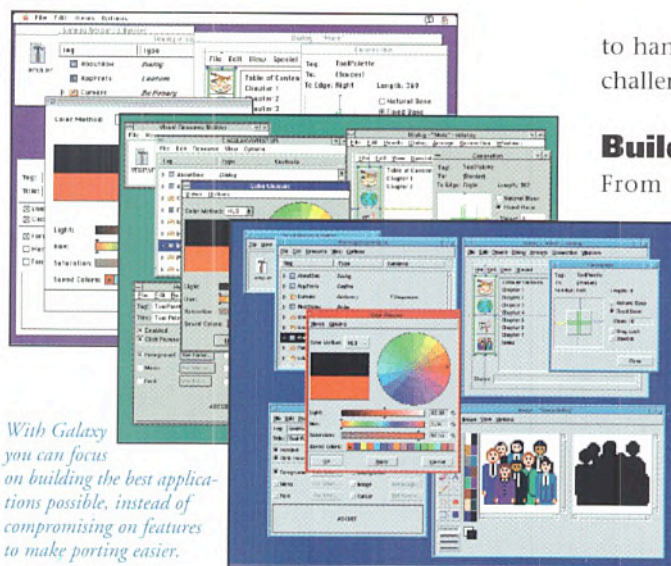
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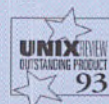
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In the States they are the national heroes behind technological showcases such as the Space Shuttle Discovery. But in the UK software development is no fairy tale. It seems that all our whizzkids have gone...

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Hold the cover about 15cm/6" away. Relax your mind and eyes. Stare through the print as if you were looking at an object twice as far away. Slowly the 3D images will materialise.

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# Happily ever after...

Once upon a time there was a little boy whose best friend was a computer. All the other boys laughed at him.



But the little boy had heard about the Ugly Duckling and he knew that one day he was going to turn into a swan. Or was he?

The Geek. So aptly he describes this industry; an epithet of the skill of the software developer. They called him a loner and jeered when he strived for meaningful dialogue with a computer. It never occurred to them that within a decade he would conquer the communications revolution of the 21st century. Forever they would fall in the shadow of his success. How jealous they must feel. That the one they mocked at school should be driving forward a technology which is changing their lives.

If only it were true... Where is the fairy godmother to transform the Geek into an enchanting prince of software development and whisk him, far, far away from these cold shores. To a high income and a smart wife in Santa Barbara? Why is the capacity to create so tragically ignored in this country?

The software development industry in the UK is in a state of decline. It is crippled by its very location: it isn't in the US. The US market is saturated; why consider British? Being thousands of miles from all the action doesn't help exports. Despite advancements in communications, fax, email and the like, it is remarkably difficult keeping in touch with a US client. For a start, there's the nine hour time difference. When *they* are getting in to work, *we* are leaving.

Then there is the attitude over here. The word 'geek' is a US term. The US has geeks, the UK does not. While not every geek will make the ranks of the computer elite, the whizzkids, it is their common aspiration. Over there, to the public at large, they are all whizzkids: each and every one of them. In the US, software development is almost chic. Glamorised by Hollywood, by NASA, the lowly programmer is elevated to the heights of American hero in the eyes of the public. The real stars of the movies are not

the actors but those who make things happen behind the scenes. What more befitting public relations machine for US software developers than the special effects and animation from companies such as Lucasfilm. Or when a 100 million television viewers watch in awe as the orange glow from the space shuttle propels science and technology into the heavens. This is US technology at its best. The people are proud; they applaud as it paints its way across the silver screen and the Solar System.

In the UK there are no whizzkids. They all crossed the pond for greener pastures, or ended up buying Tottenham Hotspurs. Attitudes in the UK are completely different. There is little in the way of incentives to keep British talent, well, British. If anything, the public feeds off entrepreneurial failings. The British people love scandal. They applaud when things go wrong.

The Government too seems to court economic disaster. It proposes cuts in the defence budget yet offers little support to the victims. Highly skilled defence staff are left to fend for themselves. It is no wonder that these people are snapped up by friends and foes alike. Rather than reskill, those in charge choose to pay £34.80 per week income support. Never before has academia been so far away from commerce. During the recession companies froze on graduate recruitment. Today the sheer numbers of skilled unemployed mean that new blood is not finding its way into the computer industry. Nobody wants to employ a raw graduate when they can have an unemployed C++ programmer with three years experience. It never occurs to them that the raw graduate could be the next British computer whizzkid.

On a worldwide scale the industry is ill. In the UK, it is dying. No one company is willing to take the risk with new commercial software. Improving existing products, adding new features, is the way in which software is being marketed today. It is only a matter of time before the end user community realises that it does not want to buy the next upgrade of bug fixes that comes complete with new bugs. Or software with features it will never need.

Software development in the UK is no fairy tale. And that's OK, because nobody *really* wants to live in a fairy tale. Nobody wants to live in a world that pays no attention to reality. That's why the whizzkids went to America.

*Cliff Saran*





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## News & Views

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## COMMENT

# Letter from the Editor

Dear Reader

EXE magazine warmly congratulates Patrick Van De Wiele and Rik Delva, the Belgium team who won the 1994 Developers Competition held in North Carolina between the 6th and 8th of October. This was the fourth year of the competition. With over 60 teams competing, the US Developers Competition is the largest of its kind. Not restricted to US software developers, the competition has a highly international flavour, with a number of the competing teams coming from outside the US. Each year, the organisers, Droege Computing Services and Advisor publications, look for a worthy organisation which requires an application to be built. The specification is produced by Droege. Teams are then judged on their ability to build the actual application using the software development tool and hardware platform of their choice. In 1994 the competitors were given two weeks to look at this spec. They then had one complete day in which to build the project.

The software was part of a larger computer system required by Habitat for Humanity. This is a non-profit making Christian organisation whose aim is to increase home ownership in the US by building quality housing which it sells at cost price. To keep cost to a minimum it uses volunteers for labour and offers mortgages with 0% interest rates. The organisation is similar to the Housing Association in the UK. Typically, it sells houses for \$40,000 which would normally cost between \$70,000 and \$80,000. During the two days of the event over \$17,000 was donated by software companies and teams.

As well as the actual competition itself, Habitat for Humanity has invited teams to put forward proposals for the entire system. The contract is worth between \$50,000 and \$100,000 for the team that is chosen. Droege estimates Habitat for Humanity will be making a saving in the order of \$350,000 to \$600,000. Previous estimates for the complete systems were between \$400,000 and \$700,000.

The 1995 competition is being held between October 5th and 7th 1995 in Durham, North Carolina. The rules have changed so that the event will run over two days. The specification will be given to competitors on the day. EXE is offering you the chance to be there to represent the UK. We will fly you and your team on an all expenses paid trip to the US to compete against the world's best in this most coveted competition. And all you have to do is show us how good you are.

It is not just any database application though. That would be far too easy. We have teamed up with Rhea Systems to produce a specification for a genuine bespoke application urgently required by the Royal National Institute for the Blind. Established in 1868 the RNIB's mission is to challenge the disabling effects of sight loss and provide information and practical help to allow people to carry on with their lives. Modelling our own EXE Software Developer's Challenge on the successful US Developers Competition, we are inviting several teams of developers to compete at building the database application from scratch within an eight hour duration. And what better way to choose the teams than from among the ranks of the highly skilled professionals, such as yourself, that read EXE magazine.

We are hoping that the competition will attract a myriad of teams and software development tools. The atmosphere will be of a software amphitheatre in which UK software gladiators will jostle with their contemporaries to produce the best database application. As judged by a jury of leading figures in the software industry. All competitors will be using identical PC hardware running DOS or Windows.

The team that develops the application which is finally chosen for the charity will be jetted off to the US to compete in the 1995 Developers Competition. Who knows? Next year it could be a British team that wins. I can think of no better way to end 1995 than by congratulating an EXE sponsored developer team.

The venue for the EXE Software Developers' Challenge will be Sandown Exhibition Centre in Surrey, during the Software Developers' Forum which is taking place on the 8th and 9th of February 1995. You can find out more about how you can help by writing to EXE magazine, Software Developers' Challenge, Freepost 39 (WD1414/29), St Giles House, 50 Poland Street, London W1E 6JZ.



Editor, EXE magazine



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## Sybase/PowerSoft merger

On November 14th, Sybase and Powersoft have announced their merger. Powersoft will continue as an independent subsidiary of Sybase. Sybase has stated that 'the merged company will continue its commitment to open systems.' But there certainly appears to be a conflict of interest between PowerSoft as a provider of database independent 4FLs and the Sybase RDBMS family. The fate of Build Momentum, Sybase's Windows development tool is not yet decided. Sybase is on 01628 597400 and Powersoft on 01628 345000.

## ORB on TCP/IP

OMG's technical committee has made some progress on the ORB 2.0 specifications. Two types of compliance have been defined: CORBA 2 Core and CORBA 2 Networked. One implication of the 'Networked' compliance is that a 'CORBA 2.0 Networked ORB must offer Inter-Orb Protocol (IOP).' This means that the ORB must work 'out of the box' on top of TCP/IP networks, even the Internet. The OMG is represented in the UK by Eric Leach Marketing (0181 5702182).

## Neural get-together

If you're working on embedded neural computing technology, and more specifically on its application to intelligent monitoring and control, then you should join the club. The Axon Club, that is. It has been set up as part of the 'Neural Computing Technology Transfer' programme of the DTI and is already working on three projects. These are an 'intelligent' medical monitoring instrumentation, a machine-health monitoring through acoustic measurements and a project trying to find how to extract useful information from a multitude of sensors readings. The Axon club will run for two years. The joining fee is £5,000 (per year). If you're interested you can contact Simon Hancock or Richard Palmer on 01730 260256.

## EXE runs the show

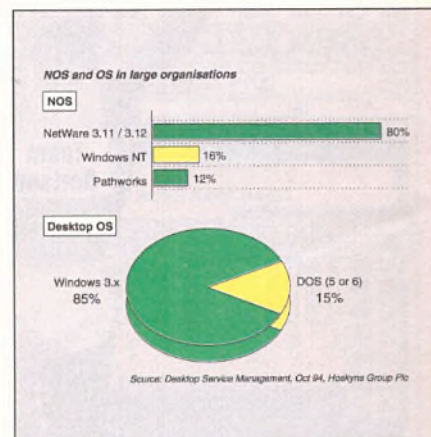
The first EXE Software Developers' Show will be held on June 8th and 9th 1995. There will be an exhibition and a seminar program. In the exhibition hall, a number of the stands will be grouped as villages. One of these will be the Lotus village where Lotus and third parties will show their latest products. The seminars will cover subjects such as development tools, development and target platforms, Client/Server, RAD and creating a Web server. The seed is planted, the development is in the process, the show will be at the Royal Horticultural Halls in London. For more information contact Tim MacPherson on 0171 2875678.

# PC Explosion

Hoskyns has recently carried out a survey among organisations with over 500 PCs. It found that many companies' IT departments do not have enough staff or are not well trained enough to cope with the demands that the PCs create. The sheer number is not the only difficulty. Multi-platform inventories of PCs, workstations, servers, printers and software as well as LAN and WAN connectivity issues create challenges of their own.

Is there still a market for stand alone applications? Probably not for large organisations. In the companies surveyed, 74% of PCs are networked today and this should rise to 92% in two years time. LAN servers are overwhelmingly based on 486 processors. Only 17% of the respondents were using Pentium but 40% of them plan to use Pentium in the next two years. As can be expected, 80% of the companies are using NetWare 3.11 or 3.12 as a NOS (16% for NT and 12% for Pathworks). What is more interesting is that only 30% of the Novell users plan to upgrade to NetWare 4 in the next two years though they will all retain NetWare.

On the desktop, Windows 3.1 or 3.11 is installed on 85% of the PCs. The rest are running DOS 5 or 6. Half of the DOS users plan to move to Windows and over half (55%) of Windows 3.x users plan to upgrade to Windows 95 over the next two years. Of the rest, 32% intend to stay with Windows 3.1 for the next two years and 5% will upgrade to Windows 3.11. The survey titled *Desktop Service Management* is published by Hoskyns Group Plc. Contact them on 0171 4342171.



NOS and OS in large organisations

# Networked documents

Six companies have joined Novell's subsidiary SoftSolutions and Xerox' division XSoft to participate in the development of DEN (Document Enabled Networking). These are Documentum, Kodak, IDI, Oracle, PC DOCS and Verity. Documentum defines DEN as 'an open software framework on which developers can build scaleable document management services and applications that interoperate across different document repositories'. In other words, applications supporting DEN will be provide uniform access to electronic documents independently of their location or the format they're in. DEN enables you to search documents over networks by the documents' attributes or content, to use and share them.

The first technical specification was published in July this year. DEN will be implemented first on NetWare and then on Unix. In the NetWare implementation, DEN will be coded as a set of NetWare 4 NLMs. DEN will work with NetWare Directory Services (NDS) to enable consistent access to documents wherever they are on the LAN. A SDK will support both an API for application developers wanting to use DEN and a SPI (Service Provider Interface) for developers to provide DEN compliant frameworks. Documentum Software Europe is on 0181 8991743.

# Borland teams up

Borland has reinforced its database position through agreements with both Sybase and Intersolv. Borland will optimise its client tools to take advantage of the functionality of Sybase SQL Server 10 RDBMS, such as referential integrity constraints. Applications concerned are Paradox and dBASE for Windows, ReportSmith and Delphi. Developers using Borland C++ will also benefit as Borland intends to add specialised functions.

The Intersolv agreement will give Borland users access to its DataDirect ODBC technology. According to Philippe Kahn, 'ODBC provides tremendous value to our Paradox 5.0 [for Windows] and dBASE 5.0 users, extending the breadth of information they can currently access'. The DataDirect ODBC Drivers pack supporting more than 35 database format is available at £350 (with 30% discount to dBASE and Paradox users). Intersolv is on 01707 812812 and Borland on 01734 321150.



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### Goodbye to asm

Developers who need to write VxDs no longer have to delve into assembly language. Vireo Software has begun shipping a new toolkit for Windows 3.1 called VToolsD. This makes it possible to develop VxDs in C and C++. The C++ library provides an object oriented framework for creating VxDs. The C runtime library is ANSI compliant. The toolkit includes QuickVxd, an interactive code generator for creating template VxDs in C or C++. The price of VToolsD is \$495 and includes full source code for the library. It is available for Visual C++ 32-bit Edition. A version for Borland C++ will be available by the end of the year. Vireo Software can be contacted in the US on 0101 508 7798352.

### Tools goes database

Rogue Wave has combined its successful Tools.h++ utility class library with database access to give DBTools.h++. Along with all the classes in Tools, the new library offers a set of classes for database manipulation. These include classes for database, table and cursor. The library itself provides a layer of insulation between application code and the native database engine. Exception handling is fully supported. DBTools is available on Windows and Unix. Until 15th December the price of the PC version is £340 which includes one access library (either Oracle 7, SQL Server or ODBC). Additional access libraries cost £170 each. DBTools.h++ is available from HyperSoft (0273 834596).

### Multi-edition!

Multi-Edit is now available for Windows. What is a Multi-editor? Sorry no answer to that one but Multi-Edit can edit up to 128 files and compare them. It can be linked to a compiler, a VCS system. Multi-Edit requires only 500 KB of real memory but it can still edit a 200 MB file on a 4 MB only system. It includes a macro language with a C-like syntax. Multi-Edit is available at £159 from Rhino Publishing (01277 632115).

### X Windows testing

Release 3.0 of XRunner is a Visual Testing, ie interactive point and click, Unix testing tools running under X Windows. According to Amnon Landan, of Mercury Interactive: 'just as visual programming revolutionised development, Visual Testing promises to simplify testing.' XRunner can also perform background testing enabling other X applications to be run simultaneously as testing on the same workstation. XRunner works on 22 different types of Unix workstations and costs from £7,500 to £10,000 depending on the system. It is available from Mercury (01634 262525)

## Of Delphi, Interbase and C++ developers

This month sees the introduction of several new development tools across both the compiler and database tools families of Borland. On the compiler front there is Borland C++ 4.5 which now supports full OLE 2.0 containers and servers. The back end compiler has been improved. Borland claims it is up to 50% faster than its predecessor and produces code which can run up to 20% faster.

It has been a long time in coming but OWL for OS/2 is finally here. For the last two years the company has stressed its platform independence against MFC. For two years OS/2 developers have waited. Now they can finally create OWL applications. It's 99% portable according to Borland. Even Windows resources can be ported to Presentation Manager. In addition to the basic compiler package, Borland will also be integrating it with the Borland Database Engine. This product will be known as Borland C++ 4.5 and Database Tools. The database engine is a 32-bit version of Borland's Database Engine and is scalable from PC to server database.

Database developers should be pleased to hear that Interbase 4.0 is finally here. And there is some good news for those readers following the development of Borland's latest project, Delphi '95. Early benchmarks by the company estimate compilation speed at 120,000 lines per minute. The compiler technology itself is characteristic of Borland Pascal. It does not offer compiler optimisation. Consequently there is a 20% performance hit when compared to a native C++ compiler.

However, unlike CA with Visual Objects, it appears Borland is not trying to capture the C++ tools market. Delphi is aimed instead at the potential PowerBuilder or Visual Basic developer. The language is Object Pascal and provides exception handling and runtime type information. One of the key features of Delphi is the ability to create new objects and controls which can be added to the Delphi toolbar. In addition, Borland will include several pre-built form templates to increase programmer productivity. Third party tools can be integrated into the IDE through an open API. Support for PVCS version control and LBMS CASE will be available.

Although Borland has not announced when it plans to ship Delphi, it has said that when it does the package will include a copy of local Interbase server so that developers can create client/server applications immediately, out of the box. If this sounds vaguely familiar to what PowerSoft is doing with PowerBuilder and Watcom SQL then it is supposed to be. But Borland claims its database server is the faster...

## Judgement day at Symantec

It's not only Borland which has been working on compilers this month. Symantec has also announced a new compiler. Unimaginatively codenamed Terminator, the product will begin shipping as Symantec C++ 7.0 by the end of December. It will feature both 16- and 32-bit compilers out of the box. A migration toolkit is provided to port 16-bit applications to 32-bit. The IDE will offer dockable toolbars, tool tips and right mouse support will be available. The editor will offer colour syntax highlighting and support Brief or Epsilon keystrokes. Furthermore it can be customised through a Basic-like macro language. However Symantec has no plans at present to produce a Symantec Basic...

The 32-bit compiler comes with MFC 3.0 and provides 32-bit OLE and ODBC features. In addition, there is support for the emerging OCX OLE custom control standard. In Symantec terminology, Express Agents are roughly equivalent to the Wizards of Microsoft. As expected, ProjExpress produces a template project and AppExpress creates a template application. In addition to the standard application types available, Symantec C++ is also able to generate templates for VBX and OCX controls. Thus developers can start creating OLE custom controls without having to purchase the MS OCX CDK. The one drawback is that MS has not licensed to Symantec any container for the OCX controls.

One advanced feature of Terminator is that both 16- and 32-bit compilers support distributed compilations where a project build can be split across several networked machines. Bad news for those who enjoy skiving to the coffee machine while their C++ compiler cranks away. Another feature to reduce build time is OptLink 6.0, a new 32-bit multi-threaded linker that Symantec claims will almost halve link time.



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## In control of VB

One of the biggest problems facing team development in Visual Basic is the absence of truly integrated version control within the environment. StarBase believes its version control software can offer what the others can't: seamless version control within VB itself. Versions/VB will work with any type of VB file, either text or binary. So it is possible to put VBXs or DLLs into the system. It can recognise FRM/FRX pairs so that changes to the FRM file are also applied to the FRX. Through the VisualDiff utility it is possible to compare files with previous versions. Versions/VB is also MS-Mail (or MAPI) aware so that developers can send messages and attach and send files to other users. The UK price is £75. It is available in the UK from Grey Matter (0364 654100) and QBS (081 9944842).

## NT stats

Visual Numerics has launched NT versions of IMSL C Numerical Libraries and IMSL Exponent Graphics. Both are 32-bit libraries which can be linked with the Microsoft Visual C++ compiler. The IMSL C Numerical Libraries consists of over 900 mathematical and statistical subroutines. The Exponent Graphics library provides more than thirty 2D and 3D technical graphs through function calls. There are more than 300 customisable graph attributes. The NT version includes a Fortran API compatible with Microsoft's 32-bit PowerStation compiler. According to Visual Numerics, the two libraries in their Unix flavours 'are used by some 200,000 developers worldwide.' The IMSL C Numerical Libraries costs £495 for NT. The IMSL Exponent Graphics costs £595. They can also be bought as a bundle for £995 from Visual Numerics (01753 790600).

## EXTRA! tools for VB

Attachmate has announced Tools for Visual Basic 3.0. These tools work in conjunction with EXTRA! for Windows. One of the main new features is 'PhotoShoot'. It enables developers to create PC applications using live PC to host displays by pointing and clicking directly on the different zones of the emulation screen. Graham Jones, MD of Attachmate Northern Europe comments: 'This latest release [...] makes the term 'process re-engineering' a welcome activity.' Another new feature in this release, Enterprise Access Tutor, lets developers interactively try out each functions to see their behaviour. When a function is 'tried' sample code is automatically generated which can be cut and pasted. Tools for VB 3.0 is available at £195 from Attachmate (01734 890390).

## Help me if you can, I'm feeling down...

Have you ever been frustrated with WinHelp? There's no full text searching capability, the file format is undocumented, the printing is primitive. Need I go on? One solution is the new release of the Hypertext Development Kit (HDK 2.5) from SoftKlone. HDK creates a hypertext help file from a text file. It uses the WinHelp engine as a viewer and WinWord 2 or 6 augmented with several new macros as an editor. Version 2.5 can now create a complete text index across all files independently of their location. The index size is about 10% of the size of the help file. HDK can also create an index for an existing HLP file. So with HDK you can, for instance, find all the references to the word 'DLL' in a compiler help file instead of the few topics referenced by the standard WinHelp search command.

To increase development speed, HDK 2.5 can generate a pseudo object based on single topic order to check the layout of the help. Help files can include graphics and animation. HDK supports 256 colours. Another improvement on the standard Windows help system is if a help file is modified, HDK tries to recreate the bookmarks automatically. Also, when HDK generated files are updated or new help files are added, HDK flags all the new topics available. The documentation of HDK 2.5 has also been improved, mainly by separating it into two different parts: the *Document Conversion Guide* and the *Interactive Editing Guide*.

All HDK generated files can be used in Hypershelf, a new product from the Australian company Virtual Media, developer of HDK. This tool uses a bookshelf paradigm to visualise the help files available on a hard disk or a network. When Hypershelf is launched, it presents a master book containing a number of volumes each representing a single help file. If many books, ie help files, are available, multiple bookshelves can be created. HDK 2.5 costs £275 and Hypershelf, £69 for a single user copy. Both are available from SoftKlone (01628 819200).

## Lotus takes Notes to the developer

Lotus is giving away Notes Release 4.0 Professional Developer's Version to 200 pre-qualified developers. The end-user version of Notes Release 4.0 should be available mid-1995 at the soonest. Steve Pelfrey, development director of Elf Technologies and a beta tester of the new release was delighted with the new version. 'Lotus has clearly done a lot of thinking about how people view and work with information. The result is a new revision of Lotus Notes that is more user definable, both from the developer's and the end user's perspective. We're also particularly enthusiastic about the wealth of new application possibilities made practical by the addition of a full-scale scripting language, along with editing and debugging tools.'

Release 4.0 will include LotusScript, a Basic compatible scripting and macro language which will work with all Lotus applications, across all platforms. LotusScript supports OLE 2.0 automation. Amongst other enhancements will be 'intelligent agents' able to scan online services for specified information. Also, the mobile users support will be improved by enabling laptops to extract information such as portions of a database or the latest email messages. Release 4.0 performances should also be increased with a bigger number of user supported per server and easier administration. One major change, cc:Mail will completely replace the current interface as an email client.

Lotus has just released Notes Server 3.2 for NT and an update of version 3.2 for NetWare. Both are full featured Notes servers and support the new Notes Express client. The NT server will run on SMP computers. The updated NetWare server supports NetWare 4.01 and 4.02, and the AppleTalk network protocol.

Notes for NT consists of the Notes Server and the Notes Administration Client. The recommended configuration is a 80486 with 32 MB of memory, 300 MB of hard disk and NT Advanced Server 3.1. It can run on NetBIOS/NetBEUI, TCP/IP and X.PC network protocols. Recommended configuration for the Notes for NetWare consists of a 80486, 32 MB of memory in addition to the file server requirements, 300 MB hard disk and NetWare 3.11, 3.12, 4.01 or 4.02. It can run on TCP/IP, SPX, AppleTalk and X.PC.

Notes Servers for NT and NetWare have an estimated street price of £265 in quantities of 100. Developer's edition of Notes Release 4.0 should be shown at Comdex and at Lotusphere '95 in Orlando, January 22nd to 26th. Lotus is on 01784 455445.



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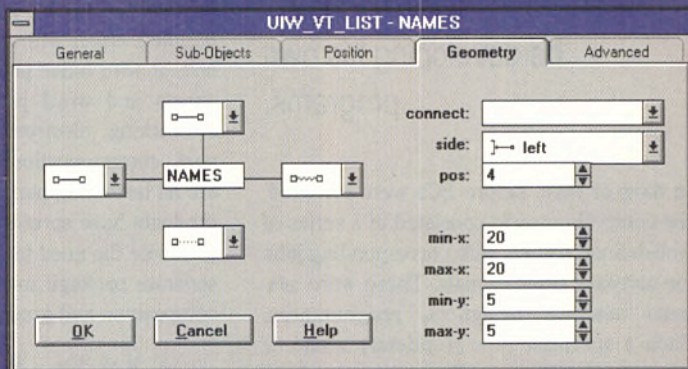
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- COMBO BOX
- NOTEBOOK
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- PULL DOWN MENU
- POP UP MENU
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# SOAPBOX

The days of job security in the software industry are disappearing warns **Trevor Hilder**. Soon the end-user will be developing his own programs.



In days of yore, before PCs were invented, the computing world consisted of a series of well-defined niches, with corresponding jobs for software professionals. There were systems analysts, designers, programmers. Each a specialist in a proprietary range of computers, using a small set of development tools and languages. Most software was bespoke, written to meet the needs of some large organisation. Things didn't change very fast. It may not have been that exciting, but most of us thought we knew where we were, and where we were going.

Like the inhabitants of medieval castles we were safe behind our impregnable glass walls, in a world nobody else understood. The invention of cheap, commodity computers has, like gunpowder weapons in the Renaissance, demolished the walls, and unleashed a torrent of change. The pace of change is accelerating. Judging from the history of the car and the telephone, we are probably only about half way through the evolution of the computer into a ubiquitous, every day appliance.

The telephone was invented in 1876. In its early days, connections were made by professional switchboard operators. Once demand for telephone services started to pick up, the telephone companies realised that they could only keep pace if they were prepared to make every user a switchboard operator. They did so, by putting the dial on the handset.

The software industry is just entering this phase now. The demand for custom software has reached the point where it is impractical for it all to be written by software specialists. We are entering the era where intelligent people, who understand what requirements must be met, should be able to create a custom system themselves, without the aid of a software specialist. In short, users need to be able to do their own programming.

The first steps down this path have already been taken, with the rise of software

packages at the expense of bespoke software. However, this is only the beginning. We are already seeing the disappearance of the software packages themselves. A number of features which used to be provided by third-party software packages are becoming bundled, either with the operating system itself, or with office products such as spreadsheets and word processors. Peer-to-peer networking, electronic mail, workflow support, communications and faxing features are all becoming part of the OS, while office products have sprouted new features which eliminate the need for most users to obtain a separate package to do, for example, page composition and graphics.



There is of course a down side to this. The application packages are losing their identity behind document-centric user interfaces. With the advent of the OLE 2 and OpenDoc standards, the user no longer sees a distinction between the operating system and his word processor, or spreadsheet package. Even internally, the OS and the application packages are becoming broken down into collections of objects with standardised interfaces between them. The popular office suites now include rapid development tools, such as Visual Basic for Applications, to make it easy to glue these objects together into customised systems.

These object-oriented technologies are immature now. They still don't embody much intelligence to help the user. However, they are evolving rapidly, so it is likely that their logical extension will become the dominant method of delivering custom applications before the year 2000.

If you think this will cost too much in computing power, consider the kind of hardware price/performance which is likely within the same time frame. By the year 2000, it is likely that hardware vendors will be able to buy a single chip with the functionality of a current PC motherboard, probably including a disk and video controller, but more powerful than today's best RISC processor, for about \$10. Many children's toys will probably contain one!

So what will happen to us, the humble software professionals? It seems likely that bespoke software, written directly in languages such as Cobol, Fortran, Pascal, C or C++, will no longer be written. This process is simply too slow, expensive and error-prone to be viable for much longer. Instead, custom systems will be assembled from OLE 2 or OpenDoc objects, using the ones provided with the OS and an office suite as the foundation. Where necessary, these will be supplemented by additional custom objects, either bought in, or written in-house.

There will therefore be a big demand for people with the skill to understand a business requirement and create a custom application from standard objects. A smaller number of people will be involved in developing custom objects, possibly still written in C++ or a similar language.

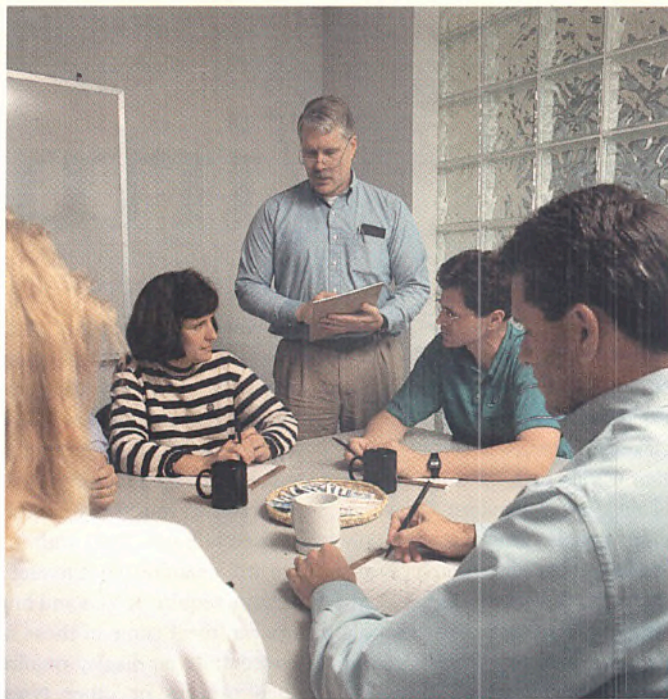
The software world will be split between builders of custom systems from standard objects and developers of those objects. The system builders will need an in-depth understanding of their target businesses and an ability to create systems rapidly for them. They will also be required to specify custom objects, find them if they already exist, or find someone to write them if they don't.

The object developers will be involved in developing high quality objects, which will be marketed and sold to system builders in the appropriate business sectors. Making sure objects are properly licensed for use poses a number of challenges. An object location, registration and licensing infrastructure will be needed. This is most likely to evolve from developments on the Internet.

Software development is about to enter a period of radical change. If your organisation hasn't started planning for this brave new world, now is the time to do it.

*Trevor Hilder describes himself as a seasoned veteran of the computer business. He runs Cavendish Software and can be reached as [Trevor@cavesoft.demon.co.uk](mailto:Trevor@cavesoft.demon.co.uk).*



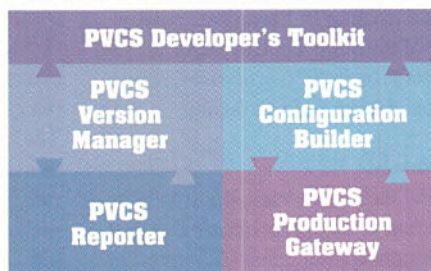


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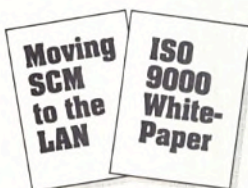
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# Virtual

By using virtual reality instead of CAD to model real world environments it is possible to attain a higher level of interaction. **Richard M Eastgate** and **John R Wilson** of the University of Nottingham describe how this can be achieved.

During the past nine months the way in which UK industries view virtual reality (VR) has changed. Previously, a few large companies were exploring VR possibilities either as 'internal marketing exercises' or by having demonstration worlds built for them by outside consultants or universities. Now, although some people see VR as only entertainment based, recent research reveals a growing market for VR within UK industry.

Industrial applications to date have largely been built using systems from Division (largely Head Mounted Display VR) and Superscape (largely Desktop VR), two of the UK's main developers. These will shortly be joined by a third company: Virtuality, whose technology will soon be available through the Elysium system jointly developed with IBM.

At VIRART (Virtual Reality Applications Research Team) we have built and demonstrated several virtual environments, for maintenance training in hazardous environments, a walkthrough control room and a virtual factory including processes, transport, storage, design and test facility.

## VR versus CAD

Any potential user examining the feasibility of VR is certain to assess its benefits against advantages gained from using CAD or other

3D modelling systems. Put simply, the trade-off is between the enhanced graphics capability and easy file transfer of CAD against the attributes of VR. The virtual environment (VE) experience is said to depend upon the participant having a feeling of presence in the virtual world and a high degree of interactivity with it. In this article we will examine what manufacturing applications require of VEs and how world builders can meet some of these needs. We will concentrate on display requirements rather than sensors or other types of effector. Within this context the emphasis is not on graphics issues *per se*, but on factors effecting interactivity; how to make objects behave, automatically or under user control, in a way that is representative of the world being modelled.

## Mimic or represent?

Modelling real world systems as virtual environments can follow two basic approaches. The first is to model closely as many of the world's features as is possible. The second is to create a rough approximation where the result is a representation rather than a simulation. The former method usually ends up with a world that is too complex for the processor to update in real time as required for interactivity, while the latter is often insufficient for the requirements of the application user. As a general rule, where possible, it is usually better to build an accurate model which mimics the real world. The resulting model is more likely to behave correctly in a variety of circumstances. It will also be easier to expand in future if the need arises. If an 'accurate' model cannot be justified on the grounds of programming or processing time, it can be replaced by a texture, an animation or a model based on a simplified algorithm. The best solution for any given application is usually a combination of accurate modelling, approximate representation and texturing or animation.

## Dumb or intelligent objects?

Materials or objects being worked upon or manipulated during a manufacturing process are generally considered 'dumb'. They have no knowledge of the process and little if any influence over it. It is the manufacturing machines or systems which have any in-

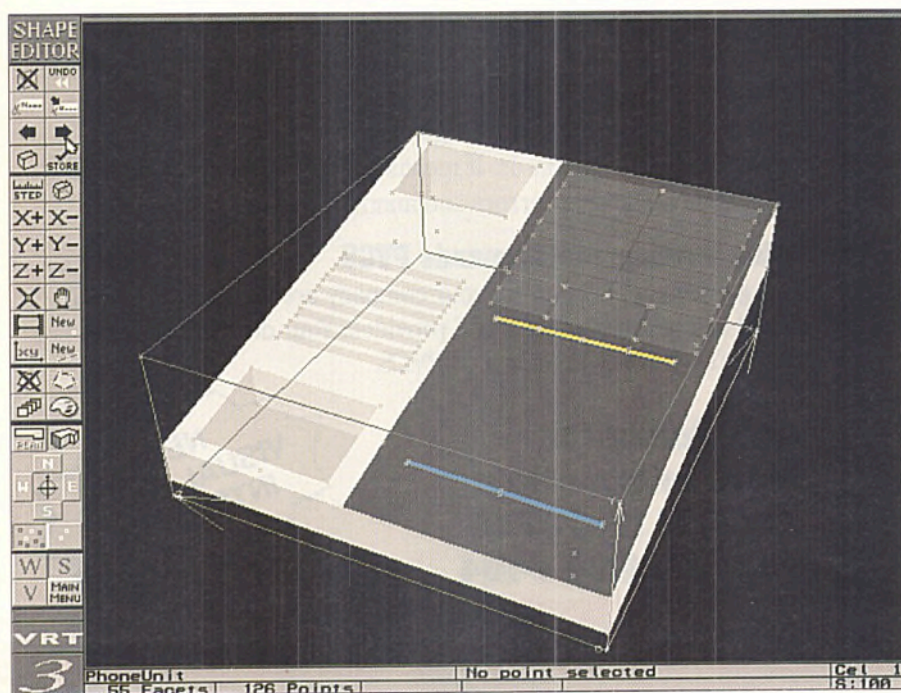


Figure 1 - The shape editor is used to build basic shapes



# Worlds

telligence and can influence the position, orientation, deformation and joining of the materials or objects. When modelling a manufacturing system in virtual environments therefore, it is best generally to attach intelligence to the machines. But sometimes it is simpler to attach intelligence to the objects being manipulated without affecting the visual representation of the process. In this way then, we are representing the real world in the most effective way possible, rather than exactly simulating it. This is at the heart of the debate of when VR is useful in manufacturing industry - when the need is for visualisation and not accurate simulation. However, this approach does have disadvantages.

For example, if an object has been programmed to sense when it is being picked up by a robot and to behave accordingly, it is likely to be able to recognise only one robot or type of robot. Also, the robot will be incapable of manipulating objects for which the user would expect it to be suitable but which do not have the required software associated with them.

## Landscape in Superscape

Superscape VRT 3.5 is a DOS based package for developing and experiencing virtual environments. It comes with a shape editor and a world editor. The shape editor as shown in Figure 1 is used for creating the basic shapes. The world editor shown in Figure 2 is used to combine shapes into objects, and place them in the virtual environments. Additionally it provides a mechanism for assigning physical and behavioural characteristics. The visualiser is a virtual world viewer in which a user can experience and interact with the environments created. The standard input devices are the mouse and the spaceball. The mouse can be used to activate objects such as switches and buttons, or to drag objects such as levers. The built-in SCL programming language is used to give these activities the desired effect. The spaceball can be used to control movement through the virtual environment of either the viewpoint, or of an object, to which a viewpoint can be attached if desired. This movement can have any or all of six degrees of freedom (linear, along X, Y and Z axes, and angular, about X, Y and Z axes) as configured by the user or programmer.

## Physical properties

The Superscape VRT incorporates the ability to assign certain physical properties to virtual objects. These include gravity (assigned separately to objects); coefficient of friction (in the horizontal plane only); coefficient of restitution (separate vertical and horizontal elements); linear velocity; angular velocity and climbing ability. Two notable omission here which would benefit the modelling of a manufacturing process are mass and centre of gravity.

Other dynamic characteristics can be programmed by the user using SCL, assigning a piece of program code to any virtual object. Thus any virtual object can be programmed to behave in a particular way independent of the other virtual objects in the same environment. Alternatively, objects can have their separate codes linked (eg via common variables) such that one object's behaviour depends upon another's.

One factor limiting the so called realism of these physical properties is temporal resolution, with inconsistency whereby rendering speed decreases as the number of facets increase. It is sometimes possible to link the dynamic properties to the processor's real time clock but it is not possible to increase the rendering speed using this

method. Instead the step size of the movement of the objects is altered. So, if the rendering speed is slow, a fast moving object will appear to jump across the screen.

## Object boundaries

All objects within the Superscape VRT are based on orthogonally oriented cuboids, regardless of their actual shape. Calculations for rendering purposes, as in object sorting and for object collisions, are based on these cuboids. If an object becomes rotated all its facets are rotated accordingly to preserve its appearance to the viewer.

However its collision and sorting cuboids do not rotate. Instead they are each replaced by the smallest orthogonal cuboid which could contain the relevant rotated cuboid. This orthogonal cuboid will be bigger than the one it replaces, which leads to the possibility of a rotated object's collision and sorting cuboids overlapping with those of neighbouring objects, causing collision and rendering inconsistencies.

These problems can be minimised by replacing single, large boundaries with many smaller boundaries such that when the object is rotated the larger, orthogonal boundaries approximate more closely to the desired rotated boundary.

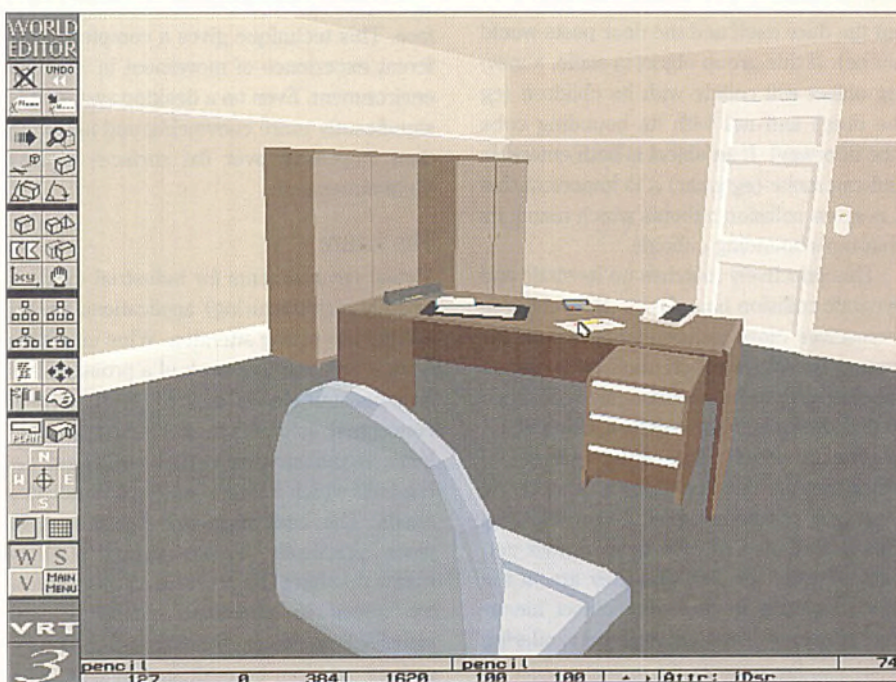


Figure 2 - Shapes can be combined into a virtual world



### After a crash...

The VRT incorporates a primitive collision detection system. Only linear collisions can be detected; rotational ones are ignored. The results of the collisions are based upon two cuboids hitting each other. No angular velocity changes are calculated (ie an object will not spin off another object). If more complex collisions need to be modelled the user has to resort to SCL. If two or more collisions take place at once it is possible that one or more may go undetected. Thus, for instance, an object can sometimes escape from within a box via its corner where it collides with more than one surface of the box simultaneously.

Collisions are programmed as a combination of a moving object which collides with a stationary one and a stationary object which is hit by a moving one. If both objects are moving however, the results can be unpredictable.

When an object is initially created its collision boundaries take the shape of its bounding cube regardless of its actual or visual shape. It is possible to replace this single collision cuboid with one or more specially assigned collision cuboids.

These collision cuboids would be set up to represent more closely the actual shape of the object. When the object moves towards a stationary, non-enterable object (eg a wall) it will collide when one or more of its collision cuboids touches the bounding cube of the other object, regardless of whether or not the other object has been assigned collision cuboids.

Where an object is made up of a group including several shapes it can be made enterable (eg a doorway would be enterable but the door itself and the door posts would not be). If this group object is static, a moving object will collide with its children (eg the door) and not with its bounding cube (the doorway). If an object is both enterable and can move (eg a car) it is important that it is given collision cuboids which match its children's bounding cuboids.

This effectively matches up its static and dynamic collision boundaries. If its children themselves move independently within the group (eg with a robot) then the collision cuboids have to be continuously re-mapped so that they match the children, using SCL.

Objects which may enter groups of which they are not a child (eg a car entering a garage) can be assigned a movable flag. This is designed to help them render correctly despite the fact that they are in the wrong position in the group-object hierarchy. However there can still be rendering problems, for example if a movable object is half in one group and half in another.

## Virtual Skiing

After several users of a neutral test environment we had built commented that the experience was not dissimilar to skiing we decided to develop a skiing experience world (which then became part of our suite of experience worlds developed for use by children with severe learning difficulties). This environment needed an undulating, sloping surface which levelled out at the bottom. After some experimentation a suitable mathematical formula based on sine functions was found to give the simplest effective solution. The surface was built in the VRT 'shape editor' as a series of square sections each of which was numbered with a 'grid reference' indicating where it fitted in the overall surface. Software to create the sections was written in SCL. The value assigned to variables as they were initialised defined which section was being built and to what resolution (ie number of facets). These shapes were then pieced together in the world editor to make the complete surface. The viewpoint was attached to a pair of skis and given a driving force to push it down the slope in the direction of the skis. The finished version has hoardings around the perimeter of the slope to prevent the skier from leaving the modelled area, and a ski lift to bring the skier back to the top of the slope. Other features such as trees and slalom poles add to the overall effect.

It is also possible to allow an object to rise above a surface, when climbing a staircase for example. This can be done by modifying the SCL code from fixing an object's height to a mathematical function to not allowing an object to fall below the height given by a mathematical function. This does, however, make subterranean travel impossible for that object. More complex SCL programs could overcome this problem but would have to be justified by the requirements of a specific application. It may also be possible to dispense with the mathematical formula, and instead link the height of an object to the point positions from the shape file for the shapes which make up the surface. This would allow a greater degree of freedom when creating surfaces which could be taken from data files for existing surfaces or terrains. If the distance between points is large, an algorithm to extrapolate between them would need to be developed to give smooth movement.

### Movement

If the vertical position of any moving object is defined by a mathematical formula it can be made to change its vertical position as it moves horizontally. If a surface is then produced from the same mathematical formula the object will appear to move over the surface. This technique gives a completely different experience of movement in a virtual environment. Even on a desktop system it is significantly more convincing and involving than movement over flat surfaces or free flight movement.

### The future

Virtual environments for industrial (and especially manufacturing) applications are receiving increasing attention. What may have been a 'solution in search of a problem' has now become clearly defined, if still largely conceptual, solutions to real industrial problems. Demonstration virtual worlds are being built which address anticipated industry needs. The next stage will be to have in place practically usable virtual environments that have the potential to meet industry needs in planning, simulation and visualisation, design, training and communications, and can be evaluated against competing technologies.

The industrial user community needs to understand more about what they can realistically expect from virtual environments and the VR developers to appreciate real application needs and therefore the world building requirements.

Everyone in the VR community is aware of the trade-offs found with all systems, especially speed of update against complexity of the world. Interactivity, as well as 'presence', will give VR an edge over CAD. The gains VEs can give users are different from those of CAD and therefore determine a different priority of technical issues. Only by a rational and logical programme of identifying, planning, building and testing virtual environments for industry will they gain increased acceptance and practical use.

*Richard Eastgate and John Wilson are part of the Virtual Reality Applications Research Team, Department of Manufacturing Engineering and Operations Management at the University of Nottingham. This article is based on a paper by the authors titled Virtual Environments in Industrial Applications: Meeting the need for Interactivity. Work includes that under grant GR/J57643. Contact them on 0115 514004.*



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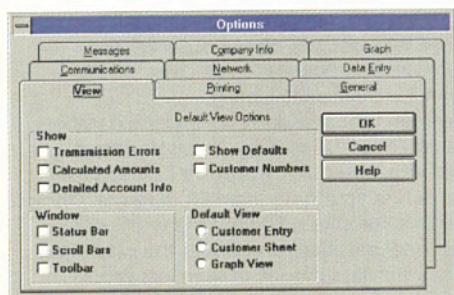
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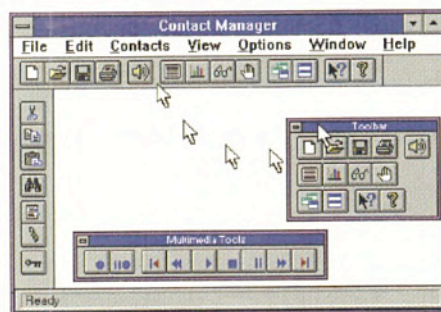
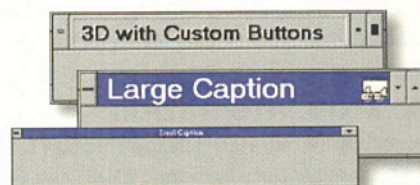
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# Parlez-vous Windows?

Colin Smith presents  several strategies you can use to manage a Windows project that needs to provide international multilingual support.

When it comes to providing multilingual support in a Windows application, adopting the right approach will reduce frustration, improve robustness and enable new national language support to be added relatively quickly. This leads to you getting a 'localised', robust product into foreign national markets before your competition. It may also be the case that your application will dominate the market at the expense of a competing application that has not been localised.

The first thing to consider are the areas of your application which are 'language' dependent. An obvious place to start is with the strings as used in `wsprintf` statements, window captions and of course dialog boxes which contain lots of strings! Then there is the question of formatting/punctuation. For instance, the US uses a different format for dates.

From a purely practical stand you should take into account that a translator will have to come along and translate your English strings for you. Translation services aren't cheap, so making it easy will help you to stay within your budget. Your translator may not necessarily be computer literate, so expect to have to explain terms (several times). Naturally you should keep everything in context. Otherwise you will have a very long lead time getting your application out. If you want to save money, you could always get your local sales agent/dealer/representatives to do the translation for you, providing of course that they are native speakers and can deal with English.

Translated strings vary in length (wildly) from language to language, therefore you have to cater for the extreme situations. Also remember that when you add new features to the application, you have to update the *string* resources, etc, for all languages and keep them in sync.

## String table

The classic (and only sensible) way to decouple 'strings' from your Windows code is to make use of *string table resources*, to package all the strings that you use in your

program. Despite endless preaching of the merits of string tables, it is surprising how few developers actually make good use of them. Unless you knew that your application eventually had to be tailored to different national markets the closest you would normally get to a string table is trying out the demos in the Windows SDK.

Thus, the first big task is to go through all the code, extracting the strings into a string-table resource, and using `LoadString` in your code. Before you go any further you should make sure that your `LoadStrings` are working properly: that text appears when it should. If you are not careful, moving all the strings out to the string table can make your code unbearable to read ie the strings are no longer in the code, they are in the string table! So on the same line after the `LoadString` statement, it is handy to leave the string as a comment, as a reminder of what the string was!


## String rich dialogs

Dialogs are one of the trickiest parts to deal with in foreign language support. Because dialogs are 'string' rich, it means that your current 'English' dialog designs will probably not be able to cope well with strings in the other language, because the translated strings (especially Finnish ones) could be much longer. Simply replacing the 'English' strings with the translated ones could mean that your static controls will contain text that is abruptly clipped. They simply are not wide enough to show the whole text.

So whatever happens, your original dialogs will have to be edited in some way. There are several ways to fix this. You could give your 'static' controls, IDs (instead of -1), so that you can then move the strings into your string table. Then in your dialogs' `WM_INITDIALOG`, you would do a `LoadString`, followed by a `SetDlgItemText` for each static control. The static controls in the dialog would then be arranged and sized, so that they show the whole of the string (no matter which language it is in). The advantage of this approach is that you only have to create one dialog 'template'

Translation services aren't cheap, so making it easy for them will help you to stay within your budget





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with all my 16-bit code?

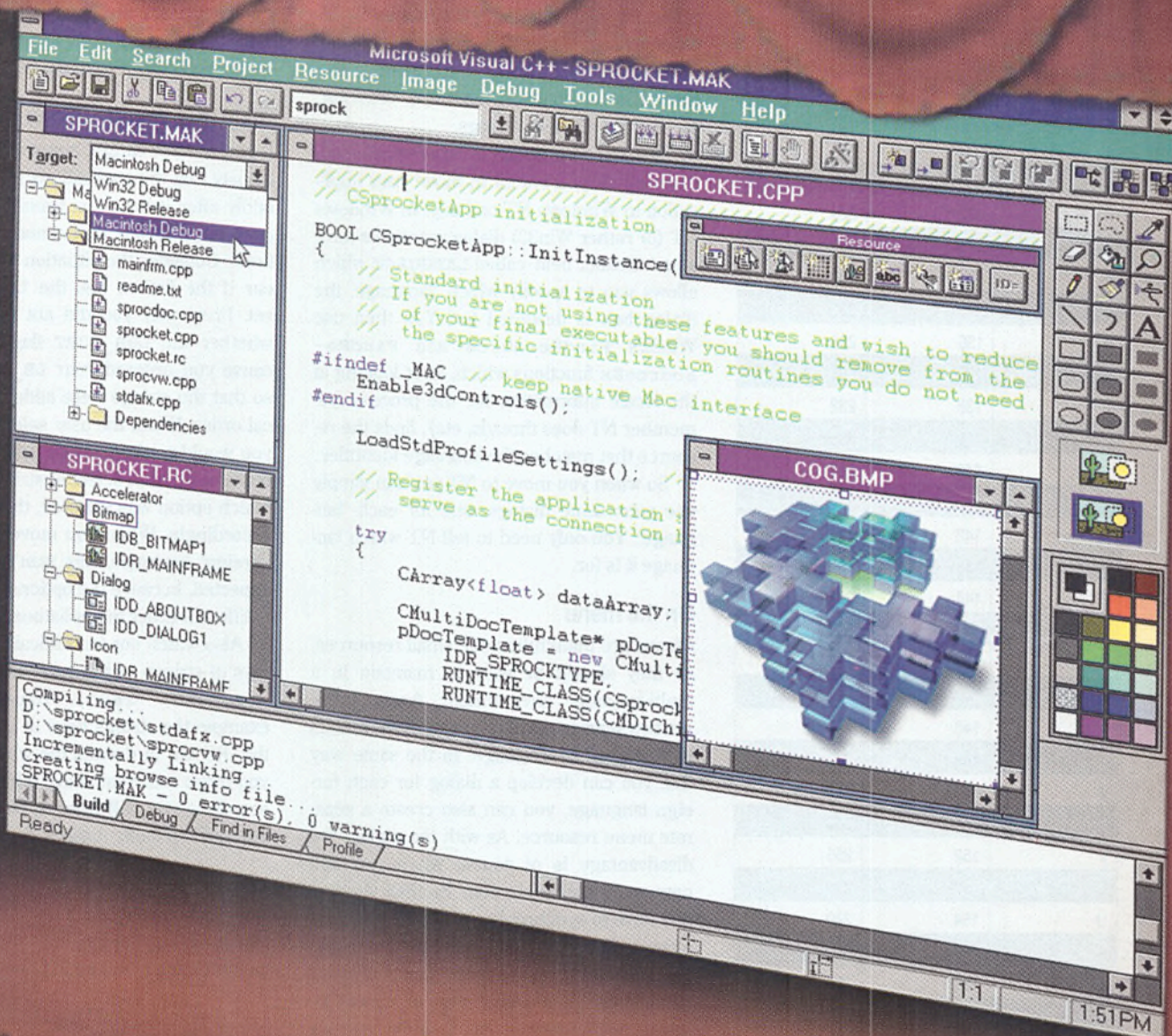
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National Character	ASCII Code (DOS)	ANSI Equivalent code (Windows)
ü	129	252
é	130	233
â	131	226
ã	132	228
ä	133	224
å	134	229
ç	135	231
ê	136	234
ë	137	235
è	138	232
ï	139	239
ì	140	238
í	141	236
Ä	142	196
Å	143	197
É	144	201
æ	145	230
Æ	146	198
ó	147	244
ô	148	246
õ	149	242
û	150	251
ù	151	249
ÿ	152	255
Ö	153	214
Ü	154	220
ç	155	162
¥	156	165
á	160	225
í	161	237
ó	162	243
ú	163	250
ñ	164	241
Ñ	165	209
ß	225	223

Figure 1 - ASCII to ANSI translations

(and thus only one set of dialog resources for each 'language'), which can be 'loaded' with the strings from the 'foreign language' in question. The disadvantage, is that the controls on the dialog may look 'spaced' out, because you have to leave enough room for the biggest string in the 'static' control. Also it makes your `WM_INITDIALOG` very cluttered.

Alternatively, you have separate dialogs for each language, with the translated strings plugged straight in. The advantage is that the dialogs are precisely designed, and compact. The disadvantage comes when you have to change the dialog for some reason. Simply adding a new control to the dialog will require you to change the

dialog for each language. If you support 16 different languages, this will eat up your time. Remember you have to maintain the same IDs for controls, tab stops, ordering, etc., across all these dialogs.

The second option is the more preferred, especially if you intend to move your application to Windows NT one day. In Windows NT (or rather Win32) dialog resources have a new 'header field' called `LANGUAGE` which allows you to specify which 'language' the dialog box is designed for. You then use Win32's `FindResource` and `FindResourceEx` functions which, after looking at the locale information for the process (remember NT does threads, etc), finds the resource that matches the language identifier.

So when you move to NT you can simply use your same dialogs, one for each 'language'. You only need to tell NT which language it is for.

### On the menu

Menus are thankfully quite small resources, so they should be easy to maintain in a multi-language environment. Again, there are two ways in which you can make menus independent of language. In the same way that you can develop a dialog for each foreign language, you can also create a separate menu resource. As with the dialog, the disadvantage is of course when you add new menu options in your English version, you have to synchronise in all the other languages. A better method would be to put the 'text' strings of the menu items into your stringtable, then make use of `CreateMenu`, `AppendMenu`, etc, to build up your menus from strings loaded from the stringtable. The disadvantage here is that you can't use a resource editor to maintain the menu.

### Sprinting F's

Remember those poor translators, who have to take all your lovely strings and produce translations that won't offend your international friends. Well, what will they make of something like "The time is %d:%d:%d tonight". You might be tempted to cut up the string into neat parts, such as:

```
"The time is",
"%d:%d:%d",
" tonight"
```

then spoon feed your translator only the edible parts. The problem is that your code has to do more `LoadStrings`. It also has to join them back together again. Plus the meaning of the sentence will be totally lost to the translator, so the translation suffers. My advice is to leave the % operators in the strings. Given

that translators are inquisitive little devils, they will probably want to be let in on the secret. So break it to them gently.

### Code that does not bode

If you are not careful you may find to your dismay that the applications starts behaving oddly after it has been translated. Take for example, a listbox that contains a list of options. Consider the situation which may occur if the listbox has the `LBS_SORT` flag set. Previously you did not have to worry whether the `LBS_SORT` flag was set, because you ordered your `LB_ADDSTRINGS` so that the strings were added in alphabetical order. When the user selected an option you would perform an `LB_GETCURSEL` (returns position of selected string) to find out which option was selected, then deal with it accordingly. When you move to a different 'foreign' language, this won't work as you expected, because the options will end up in a different order in the listbox.

Also watch out for statically allocated arrays of strings as in `char array[] = { "orange", "red", "blue" };`. In this example the strings have to be banished to the .RC file (it defeats the whole purpose if you move some and leave others). As a consequence you will have to change the way you refer to them. A quick fix would be:

```
char array[3][80];
...
LoadString( array[0] )
LoadString( array[1] )
...
```

Unfortunately you would soon use up your static data. If you were so inclined you could treat your 'string table' as a big array, which is basically what it is. Thus your 'char array' would be a sub-array of it.

### The final product - not yet!

Having gone through the task of translating and reorganising the code, you then have to decide how the product will be packaged. You could include all languages in one box. Then, during the installation the required language would be selected. The advantage, is that you can produce a single shrink-wrapped product that can be sold in all countries which could help reduce costs (the manuals would be the only component that would be country specific). It would also be a useful marketing ploy in any country to have a 'multi-language' product.

The other approach is simply to provide a version which is country specific. The hassle with this approach is that you have to make up an installation for each language when something changes. Programmers don't like being turned into version persons.



```

hrc1 = myfopen( buf1, ".RC", "rt" );
htxt1= myfopen( buf2, ".TXT", "a+t" );
hrc2 = myfopen( buf3, ".RC", "wt" );

lineno = 0;

printf( "\r\nProcessing...\r\n" );

while( !feof( hrc1 ) )
{
    if( !(++lineno % 100) )
        printf( "Line %ld \r", lineno );
    GetNextLine( hrc1, buf4 );

    if (Option == STRIP)
        ReplaceStringsWithTokens( buf4 );
    else
        ReplaceTokensWithStrings( buf4 );

    fputs( buf4, hrc2 );
}

printf( "Finished.\r\n" );

fclose( hrc1 );
fclose( htxt1 );
fclose( hrc2 );

```

Figure 2 - The main loop of RCMAN

## Funny characters

If you use a text editor like Brief to edit the .RC file, you will notice that the special characters used in strings, such as umlaut, will not look like umlaut. This is because a .RC file uses the Windows ANSI character set for its strings. DOS is using the ASCII (extended IBM) character set and the English code page. If you want to add umlauts then you need to enter the characters as ANSI not ASCII codes. The translation will only be needed if unwittingly you used a DOS editor to edit the .RC file, thus making 'national' characters appear as ASCII. If you stick to a Windows 'text' editor then things should be fine.

## Resources and their sources

Normally when you create dialogs or menus, you throw them into a .RC file, which gets squeezed through the resource compiler, before finally being linked to your executable. The resources are part of the .EXE, and go where it goes.

If you wanted your application to provide support for all the foreign language in one box, this approach would mean having executables that were exactly the same apart from the resource portion (that is language dependent). Obviously this is a total waste of disk space.

There is a simple way to decouple your resources from your applications executable. It is simply to create a resource only DLL, which contains your foreign language resources and no code, apart from the obligatory **LibMain** and **WEP**. But how does your application get access to the resources since they are in a different module now? Well, if you look at the 'resource' based API functions, such as **DialogBox**, **LoadString**, **LoadIcon** and **LoadBitmap**, you will notice that they have an 'instance' field as one of the parameters. Until now, that has simply been the instance of your application. But, now you can do a **LoadLibrary** of your resource only DLL, which provides you with an instance handle that you can give to **LoadString** and **DialogBox**, etc., so that they know where to look for the resource.

Thus, all you need to do is create a separate DLL for each country, eg **ENGLAND.DLL**. To make your **LoadLibrary** life simpler, you could tell it to look for the DLL called **MYLANG.DLL**. Your install program would then just create the **MYLANG.DLL** by copying the country DLL (eg **SPAIN.DLL**) to that name.

If your application consists of a number of EXEs and DLLs, then they are quite welcome to do a **LoadLibrary** of your 'language' DLL, in their **WinMain** or **LibMain**,

so that they can gain access to the 'foreign speak'. It is thus possible to maintain all country specific stuff in one place.

If, while you are developing code, you suddenly have to switch to another 'foreign' language, because your 'perfectionist' boss has been told that a string in the about box of the Icelandic version looks strange, then there is no problem. All you would have to do would be to copy over the **MYLANG.DLL** with **ICELAND.DLL**. You wouldn't have to install a hardcoded Icelandic version of the application, or maintain all language specific versions on your precious hard disk.

There is another advantage to organising your resources in this way. If your translators have Windows available, you could provide them with a compiled version of your application plus the Microsoft Resource Compiler, a linker and the .OBJ files to the resource only DLL. They could then edit the .RC file containing the strings that they have to translate and run a batch file which would build the resource only DLL. The application could be run to see the translated strings in their proper place, and in context. Thus, you don't have the translator ringing you up every five minutes. If your application will be for Windows NT then there is no need for this technique, because you simply use the **LANGUAGE** statement, and associated 'language' independent functions.

## RCMAN

RCMAN is a simple utility I've knocked together that you can use to manage all the strings in your RC files that will probably need translating - saving you hours of frustration. It provides a way to extract the strings required for translating into a separate file (the STRIP mode), which can then be translated, and a way to insert the strings from the translated file back into the RC file (the PLUG mode).

Figure 2, shows the main loop of RCMAN. In the STRIP mode, RCMAN takes your original RC file, and generates two files - a copy of your RC file with strings replaced by numbered tokens (eg @@101) and a text file which contains the extracted strings ie 'strings to be translated'. The strings in the text file are numbered, and correspond to the numbered 'tokens' used in the RC file.

In the PLUG mode, RCMAN takes the 'tokenised' RC file and the 'strings to be translated' text file (which by now should be translated), then generates a new RC file with the tokens replaced by the 'translated' strings. You now have a 'translated' RC file.

Figure 3, shows the PLUG routine which is used to replace tokens in a line read from



```

int ReplaceTokensWithStrings( char *buf )
{
    char *p, *string, *p2;
    int retvalue = 0, no;
    do
    {
        if( (p = strstr( buf, "@@" )) == NULL )
            p = strstr(buf, "++" );
        if( !p ) return retvalue;
        string = FindStringNumber( htntl, no = myatoi( p + 2 ) );
        if( string )
        {
            memmove( p2 = p + strlen(string) + 2, pText,
                    strlen(pText) + 2 + 1 );

            *p++ = '\0';
            strcpy( p, string );
            p2[-1] = '\0';
            retvalue++;
        }
        else
            printf( "\r\nWarning (%ld): cannot find string number
%d\r\n", lineno, no );
    } while( string );
    return retvalue;
}

```

Figure 3 - The Plug function

the 'tokenised' RC file, with the 'translated' strings from the 'translated strings' text file. The `FindStringNumber` function finds the 'numbered' string in the 'translated strings' text file.

The text file RCMAN generates is an ideal way to present the strings that need to be translated. All the translators have to do is use a word processor. If they have problems understanding a 'string' then they can quote the 'string' number and you can provide an explanation. Compare this with the horrors of giving them the RC file to edit. They would find it a slow task going through the .RC file to find strings to be translated. They would certainly have missed some strings. Also you'd be lucky if you could compile it again once they'd hacked about with it.

The other good thing about using RCMAN is that 'duplicate' strings won't be translated twice, because RCMAN will only take out strings it has not come across before ie strings not already in the HTXT1 file. I dare you to do this by hand!

### Help me with my Help

If you have just recovered from creating the pretty Windows Help file for the application, by hand with Microsoft Word and the Help Compiler then you will wish you never heard of the thing. Because, you are more or less going to have to start from scratch to

do the Help files for other languages. If you can't convince your German distributors to do the Help file, or get them to understand how they work, then you will have to do it

**But Windows NT is the  
direction in which we  
are all being cajoled**

yourself. In situations such as these a Help File manager such as Doc-To-Help, or ABC Help Builder, assumes extra importance.

### Other internationalisation issues

Apart from dealing with the 'textual' part of your application, you may also have to deal with national formatting conventions eg format of numeric quantities, dates, time, etc. If you are in Windows NT you can use its own functions such as `GetLocalInfoW`, `GetTimeFormatW` or your compilers own locale functions (`localeconv`, `strftime`, `setlocale`).

On the other hand, if your compiler and API do let you down on international formatting support, then you could alternatively make use of 'The INTL Package' by Björn Fahller. It is a shareware package that consists of a DLL that provides a mini API for

dealing with these formatting issues. It provides functions like `IntlFloatToString`, `IntlGetPhrase`, `IntlCurrencyToString`, which ultimately means that your application never has to be aware of the language in use. The registration fee is US\$55 or SEK300 (the author is Swedish).

### Unicode

Microsoft's use of Unicode in Windows NT is its apology for using the ANSI character set in the standard 16-bit version of Windows. The ANSI character set is only really able to cope with the English, Germanic, Scandinavian, and Romance languages. The classic fudge has been to use additional OEM character sets.

Because a character in a string is not necessarily a single byte, you will have to make pointer arithmetic, independent of the character set being used. For instance, `lpmidchar = (lpLast - lpFirst) / 2`, would be different with Unicode characters. There are lots of special functions and types that you can use in NT to support Unicode, so be prepared.

If you thought it was a chore creating a specialised font in Windows (16-bit), then you'll cry if you have to create a Windows NT font (properly), because you'll have to do at least 1,000 glyphs! But Windows NT is a much more natural environment for international support. It is the direction in which we are all being cajoled (or dragged, kicking and screaming).

### Conclusion

You might wonder whether it is worth all this hassle to make your application truly international. But if it means that overseas (or over the border) sales will account for the majority of your sales, then at least your accountant will be smiling.

Finally, I take no responsibility for any arguments between programmers on the best method to do the dialog or menus for different 'languages'. You can fight it out amongst yourselves!

*Colin Smith currently works at Trans-Send International on the recently launched Trans-Send WinDOS Pro comms package. You may be able to contact him as [colin.smith@por-tofc.org](mailto:colin.smith@por-tofc.org).*

*Björn Fahller author of The INTL Package can be contacted on the Internet at - [d89-bfr@sm.luth.se](mailto:d89-bfr@sm.luth.se), and his shareware package should be able from most shareware disk vendors.*

*The code discussed in this article is available on diskette. Please send an SAE (marked RCMAN) and a diskette to the EXE address.*



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# EXE Compiler Report - PART I

This article is the first part of a new series of major product reviews specially commissioned from **Rhea Laboratories**. The series is designed to provide a more extensive view than can normally be achieved within a magazine. The articles are effectively subsets of separate and more extensive reports that are published and available separately. We start with a two part review of the leading C++ development tools.



The Visual Workbench project management facilities are a great improvement over the MS VC 1.5 version.

The world is moving inexorably towards C++ to such an extent that the choice of language for new development projects is hardly an issue. But it is more difficult and arguably more important to choose the right supplier. A development project can easily last for two or three years. The end product may need to be supported and maintained for another five to 10. Thus the wrong initial choice could prove very expensive.

We have isolated eight leading suppliers of C++ compilers for DOS, Windows and OS/2. In this issue we begin with Microsoft. Next month we'll add Borland and Symatec. Then end with the Free Software Foundation, IBM, JPI, Metaware and Watcom. We will be looking particularly at when and where the lesser known products can perform better than the leaders. Please note that because of publishing time scales, some products that we examine as beta versions are likely to be shipping by the time you read the article.

## Microsoft Visual C++ 1.5

Microsoft was unable to supply a copy of Visual C++ 1.51 in time for this review. It is taken to be a relatively minor upgrade to 1.5. Microsoft Visual C++ 1.5x (MS VC1.5) is supposed to be Microsoft's last C/C++ offering in the 16-bit world. New and future products from Visual C++ 2.0 onwards are 32-bit native products that will run under Chicago (Windows '95) or Windows NT only.

## No templates

The MS VC1.5 language implementation is based upon the draft ANSI standard and the ARM.

MS VC1.5 does not support templates, although `template` is a reserved word.

ANSI exception processing is not supported in MS VC1.5 either, although the `try`, `catch`, `throw` keywords are reserved. In addition, MS VC1.5 does provide a series of macros such as `TRY`, `CATCH`, `AND_CATCH`, `END_CATCH`, `THROW` and `THROW_LAST`. There is also a `CException` Class. These are based upon, but not

identical to, the ANSI/ARM language extensions for exception handling.

Microsoft has included several specific language extensions to support the Intel 80x86 segmented architecture. These include `__near`, `__far`, `__huge`, `__based`, `__segname`, `__self` and `__segment`. There are also some added language extensions to support low-level code development such as `__interrupt` and `__asm`. These are adequate for writing interrupt service routines in C/C++. You must of course take care in `__interrupt` functions over just what is and is not re-entrant. If you need to delve into assembly language, the compiler includes a good general-purpose inline assembler. It should be sufficient to support most of the minor routines that might need coding in assembler, without needing to go out and buy a separate assembler package.

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`.

## Light development

The source code editor is a bit basic. The main starting point of MS VC 1.5 is a standard MDI (Multiple Document Interface) application, which is uncluttered and easy on the eye. But it is a bit light on some facilities. There is no search or find-and-replace spanning multiple files, no macro facilities, no user-definable key bindings, no drag and drop editing, no hooks for revision control software, only one level of 'Undo' and so on. However, it is easy to use, allows easy changes to code indenting and is fairly robust. Like most modern code editors, it supports colour syntax highlighting with user-configurable colours.

One minor nuisance is that CTRL-P, which shows a drop-down selection list of editable files in the current project, is on the toolbar. It does not have a corresponding menu option and is 'bound' to the toolbar.



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## FEATURE

Turn off the toolbar and the facility disappears.

The Visual Workbench editor supports three 'Workspaces', which are custom arrangements of edit/debug/other windows, on the screen. These are labelled 'Edit', 'Debug' and 'Custom'. This makes it easy to have MS VC full-screen with a large source editing window when editing your code and to reduce it to a half-screen window with a small source window and a small debug window (to make room for your application's window on the desktop) when debugging.

### Browsing and references

The browsing facilities are very useful and quite powerful. At its simplest, you place the cursor in a variable or function name then hit F11 to bring up the definition. With Shift+F11 it is possible to work down a trail of all references to selected variable or function. It's easy to use; quite painless. The trouble is, it does not quite work. Cases like:

```
DLGPROC lpProcLogon;  
lpProcLogon=  
(DLGPROC) MakeProcInstance  
(  
    (FARPROC) &DlgSubLogon,  
    hMainInstance  
);
```

do not always show up as references to the function `DlgSubLogon`. Since such cases are the lifeblood of much Windows programming, this perhaps has to count as VC1.5's worst bad habit. Incidentally, the above example gets tracked fine if you leave off the 's' and let the C compiler implicitly yield the function address, rather than giving it explicitly.

There are two other problems with the Browser. One is that it is not a GREP. You cannot find abstract text strings, only complete identifier tokens. So you cannot search for text in a comment or text string. The other is that it is based on a database that is only built *last*, after a successful complete project build and link. This can be a nuisance during the earlier stages of project development.

### Project dilemma

An MS VC project produces a single end result, be it an EXE file, a DLL, or a library. There is no concept of a project made up of other projects, or a project that produces more than one target executable/library. This becomes a problem when developing an application that you may wish to build as several components, say a main EXE, a couple of DLLs, an Install, an Uninstall, and so

	Visual C++ 1.5	Visual C++ 2.0
Description	C++ development system for 16-bit DOS and 16-bit Windows	C++ development system for 32-bit Windows systems
Price	£300	£300
Support	free for 90 days after first phone call	Free for 90 days after first phone call
Network Support	None	None.
Contact	Microsoft	Microsoft.
For	Microsoft. It's robust, workmanlike, and easy to use. Browse facilities are excellent, but only available AFTER a clean compilation.	Microsoft. It's robust, workmanlike, and easy to use. Browse facilities are excellent, but only available AFTER a clean compilation. Global Find now implemented, but no Global Replace. Template & Exception handling. Remote serial debugging.
Against	Weak editor implemented, but no Global Replace. 16-bit ONLY No Global text search facilities. No network or remote serial debugging. No templates.	32-bit ONLY. Exception handling not ANSI/ARM No LAN debugging.

Figure 1 - Summary of Visual C++ 1.5 and 2.0

on. It is made worse by the fact that the 'recent projects' list can only contain four projects.

The product includes only facilities for the development of 16-bit applications, with no 32-bit support. For protected-mode 286 development, it includes PharLap's 286 i DOS Extender Lite. The documentation hardly mentions it though. Nor is it supported in the options covered by the Microsoft Visual Workbench. The PharLap README justifiably shows some signs of irritation: 'The Microsoft Visual C++ compiler, CL.EXE, is capable of creating protected-mode executables using the (nearly undocumented) '-Lp' switch, and the 'STUB' directive of a .DEF file.' Certainly there is no obvious mention of -Lp or any option that might set it in the Visual Workbench's Options/Project dialog.

### Class act

One main feature of the MS VC product is of course the MFC foundation class library. The version of MFC shipped with MS VC1.5 is MFC 2.0, which supports OLE 2 and ODBC for Database applications. There have been some changes in MFC since version 1.0. Anyone wanting to upgrade from MS VC 1.0/MFC1.0 to MS VC1.5/MFC 2.0 will find that the conversion is time-consuming if generally fairly straightforward.

### Resource Tools

The main Resource Tool is App Studio. This is a straightforward resource builder that allows you to build Bitmaps, Cursors, Dialog templates, Icons, Menus and String tables. One annoying omission is that it cannot build version information structures. This is

surprising, since Microsoft really needs everyone to build proper version information into their applications, to make install/uninstall programs work properly. Under MSVC 1.5, you still have to build your version information by hand.

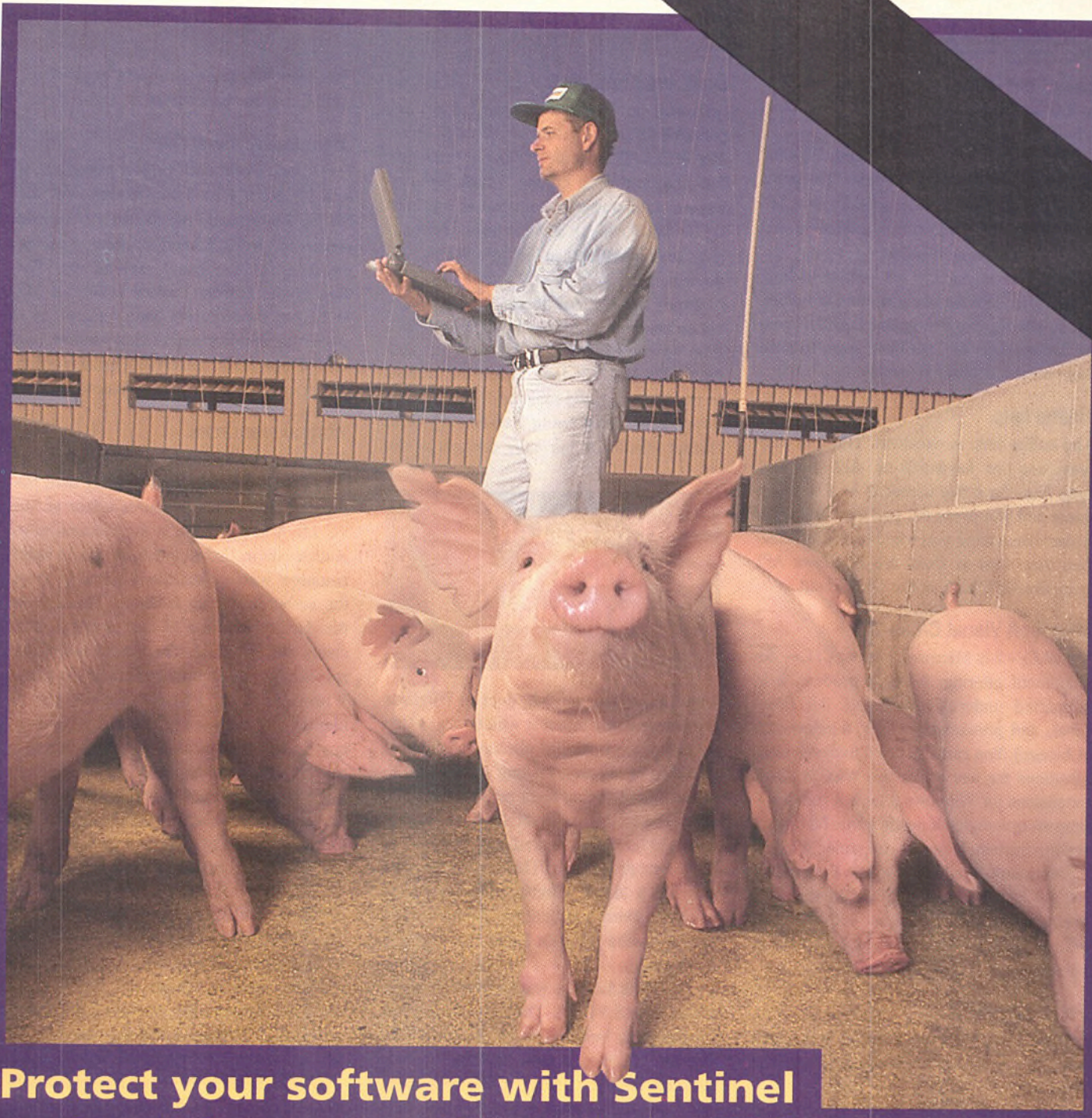
Integration of the resources to source editing is by the *Class Wizard*. This tool allows you to relate your Windows classes to their visual representation on a dialog and to map Windows Messages directly to class functions in the C++ program. The result is in many ways similar to the way Visual Basic works, with a function for each handled message on each control on each window. It works well provided you want to base your application on the MFC classes. Traditionalists would perhaps have liked a similar facility based on the `<windowsx.h>` 'Message Crackers' for the standard API.

The final major component is *App Wizard*. This takes a few basic parameters such as whether the application should be MDI/SDI, have a toolbar, require Print preview or support OLE 2. It then generates a set of C++ source files, ready for you to fill in the actual application code. In conjunction with Class Wizard (and it's next to impossible to use Class Wizard on files that weren't created by App Wizard), it is not too difficult to start building a reasonably powerful application quite quickly, provided we're talking about a standard application, which opens, manipulates, saves and closes document files, or a database.

### Debugging with VC++

The Visual Workbench built-in debugger for Windows is generally adequate for most 'standard' applications. Since it is fully inte-





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grated, the combination of debugger and context-sensitive Browser can be very powerful indeed.

The package also includes CodeView for DOS and CodeView for Windows. The latter being *very* clearly a DOS product that Microsoft has hacked to run in a Window and drive a Windows application.

There is no facility for remote debugging, either on a serial connection or by network. The remote debugging facilities from earlier versions of CodeView seem to have been removed in this release.

## Online help

The online help is excellent. There is easy searching for keywords in ALL relevant help files. So if the cursor is in a function name and you press F1, you may first get a dialog box asking you whether the information you want is from the Windows API help, the MFC help, or the OLE 2 help.

## Microsoft Visual C/C++ 2.0

Visual C++ 2 is Microsoft's latest C/C++ development offering. A 32-bit product, it is supported under Windows NT 3.5 (Daytona), and presumably under Windows '95 (Chicago). You can also use it to develop applications for use under the Win32s 32-bit extensions for Windows 3.1x, but the development system itself needs a true 32-bit Operating System. It cannot run under Win32s.

Microsoft supplied us with a Beta of MS VC 2.0 for review on a CD-ROM that also contained a Beta 2 release of Windows NT3.5. By now Visual C++ 2.0 should be shipping.

## Following ANSI

MS VC 2.0 conforms to C++ 3.0. It is based upon the proposed ANSI standard and the ARM.

It includes support for Templates and Exception processing, conforming to the ARM and draft ANSI standard proposals. Because MS VC2.0 does not support 16-bit development, it no longer requires many of the 16-bit language extensions such as `__near`, `__far` and `__huge`.

However, the new `__declspec()` modifier provides a number of language extensions to help handle Windows and multi-threaded software development. For instance `__declspec(thread)` is used to declare storage allocated on a per-thread basis; `__declspec(naked)` causes the compiler to generate the function being declared without prolog and epilog code; `__declspec(dllexport)` replaces `__export` and `__declspec(dllimport)` specifically imports the defined object from a DLL.

## Drag, drop and dock

Microsoft has made several significant improvements to the Visual Workbench since MS VC 1.5. The source editor now includes full drag and drop editing, which reduces keying when you want to move or reorganise blocks of code. It also includes customisable toolbars that can be free-floating or docked.

From the Options menu, you can now set up the main Workbench windows (other than source windows) to be 'docking windows'. Docked Windows attach themselves to the bottom of the main MDI parent window, rather than being free-floating. The Output window is normally docked by de-

The lack of a LAN debug facility is a definite limitation.

fault. In the beta version, docked Windows are permanently topmost which means that they may 'aggressively' obscure any source windows on display, making it awkward to resize them to bring them entirely back into view. The facility for multiple 'Work spaces' seems to have disappeared, which we feel to be a retrograde step. The output Window now has a *tabbed* selector, allowing you to select between build output, debug output, search results (Find In Files) and Profiling information.

Browsing facilities were one of the better points of MS VC 1.5. The new version has continued to build on those facilities. Like version 1.5, the browse facilities are not available until you manage a relatively clean build of your entire project, which still seems to be a serious limitation. Microsoft has, however, added a 'Search/Find in Files' facility, which allows you to search across any required selection of files for any text. This addresses the two main limitations of the Browser: its unavailability until after a complete build and its inability to find, for example, text in strings or comments. The Browser also seems to have fixed the reference bug identified in the 1.5x release.

Microsoft has integrated several tools that were previously standalone directly into the Visual Workbench. These include the Source Profiler, message SPY and the MFC trace settings control.

The MS VC 2.0 compiler comes with MFC 3.0 foundation classes for 32-bit software development. The major difference between MFC 2.0 and MFC 3.0 is that the

latter contains more complete support for multi-threaded applications.

## Organise by hierarchy

The Visual Workbench project management facilities are a great improvement over the MS VC 1.5 version. Projects can now contain several hierarchical 'groups', opening up the possibility of compound projects etc. The 'files in the current Project' facility of MS VC1.5 has consequently been replaced by a proper hierarchical project view window, and Ctrl+P now performs its more usual function of printing the current file or window.

## Integral resources

Resource manipulation is now fully integrated with the workbench rather than the separate App Studio resource editor of MS VC 1.5. A key addition is the Version Information editor, that now allows you to build resource version structures directly from the resource editing facilities. The lack of this facility was one of our stronger criticisms of MS VC 1.5. The integration of the resources to the source code is by the Class Wizard. As in MS VC1.5, this allows you to identify any message or action intended for any on-screen control, and to link this to a source function to handle it. As an improvement to MS VC 1.5, Class Wizard now identifies whether an action is derived directly from a Windows Message, or from an inherited function from the MFC classes.

## Remote debug

The MSVC 2.0 package now has some remote debug facilities. For standard Intel-platform systems, these are based on a serial link between the machine running the code to be debugged and the machine on which you are developing.

The lack of a LAN debug facility is a definite limitation. The debugging facilities are quite good, however, and include facilities for setting and tracking the status of individual threads in a multi-threaded application.

## Competitors

As I said at the start, in January I will be looking at two competitors to the Microsoft C++ compilers. These will be Borland C++ and Symantec C++. In February I will end the series with a roundup of the remaining C++ compilers for PC platforms.

*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 071 287 5000 for details.*



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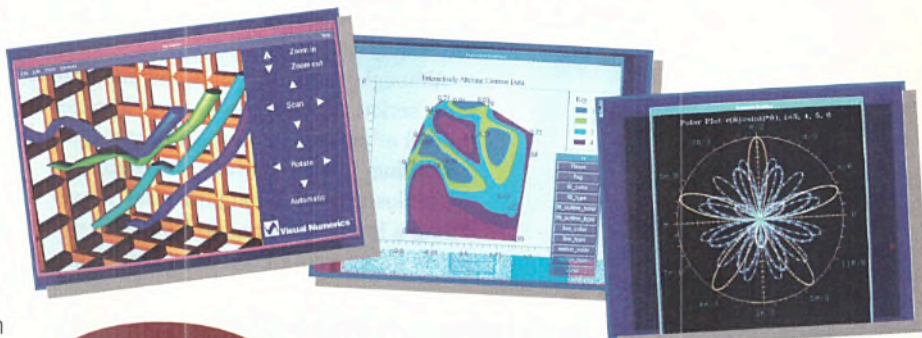
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# Five go cross-platform - PT II

As if the bunch of GUI libraries last month  wasn't enough to mix you up, Laine brings on a couple more that have a slightly different twist and also tries to make sense of it all.

About ten years ago, I wrote my first magazine article for a small, semi-monthly journal published in Bend, Oregon called *Micro Cornucopia*. This article turned into a regular column. I would end each one with a preview of what I would do in the next. Inevitably I never actually wrote anything about said topic in the next issue. By the time the final issue of *Micro C* was published in 1989 or so, I had finally figured out that I could never follow up on my plans, so I vowed never to say anything about 'next issue' in anything I wrote subsequently.

Just over three years ago, I began writing columns for EXE. During the last three years, I have tried to remember the lesson I learned from *Micro C*. I believe I have been moderately successful at not promising anything I could not deliver. So what possessed me to make such bold claims about writing some serious programs in five (count 'em, five) different GUI libraries and compiling them on several different platforms, I just don't know, especially considering that, not only does EXE publish twice as often as *Micro C* did, but also my current job is much more demanding than the jobs I had between 1985 and 1989. And I married in 1990. And our household is dominated by a very demanding cat...

Although it might be useful to write some serious applications in these libraries and tell of my experiences, it might also be misleading. It is far too easy to misinterpret the philosophy of a complex class library during a brief exposure. So, I will limit myself to giving you a brief comparison sum-

mary by topic of the five class libraries I covered last month, along with some information about two Windows API 'translation libraries' that allow you to port existing Windows applications easily to Motif.

To refresh your memories, the five multipatform GUI class libraries I described last month were C++/Views 3.0 from Liant Software, StarView 2.2 from Star Division, XVT Development Solution for C++ 4.0 from XVT Software, zApp 2.11 from Inmark Development and Zinc Application Framework 4.0 from Zinc Software.

## Control king

In terms of number and variety of controls, Zinc is definitely the winner, including not only masked edits and tables (spreadsheets), but also scrolling list boxes containing check boxes and a paging control similar to the notebook tabs used in Word for Windows, among others. zApp (lacking the notebook control, but not much else) and StarView are a close second here. XVT and C++/Views are weak in this category, having only the basic controls offered by the standard Windows API with a few minor additions. While you can easily add masked edits such as dates, numerics, etc, they will not integrate well with the development environments' dialog editors. And a control such as a table is a non-trivial task indeed.

## Print superstar

StarView has the best printing capability of any of these packages by far. If you are writing a word processor, you may choose StarView just on this point. The worst in this category is C++/Views, which only supports printing on Windows and OS/2. The other three libraries support printing on all platforms, but the support for fonts and previewing isn't nearly as full as StarView.

## Characters extraordinaire

Here there are two winners. Zinc and StarView are well above the others in this category. While zApp (the one with the weakest international support) merely supports different currency symbols and date formats, Zinc and StarView also support

Product	Distributor	Email address
C++/Views	Liant, UK, 071 7992434	support@liant.co.uk
StarView	Star Division 0533 626999	svinfo@stardiv.de
XVT Power++	Personal Workstations 071 2310333	fburnett@perwork.co.uk
zApp	PTS/Software Plus 0928 579900	info@inmark.com
Zinc	Zinc U.K. 081 8859918	info@zinc.com
Wind/U	Protek 0628 75959	support@protek.co.uk
MainWin	(Paris) Anne Dorange, Diva +33 1-34651819 (USA) MainSoft, +1-408-774-3400	adoran@diva.fr mainwin@mainsoft.com

Figure 1 - Distributors and their email addresses



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(See FORTRAN Section)

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## NEWS

- 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.
- Btrieve Technologies demerge from Novell All Btrieve products & upgrades now available from System Science.
- EasyCASE Database Engineer module for SQL development and reverse engineering.
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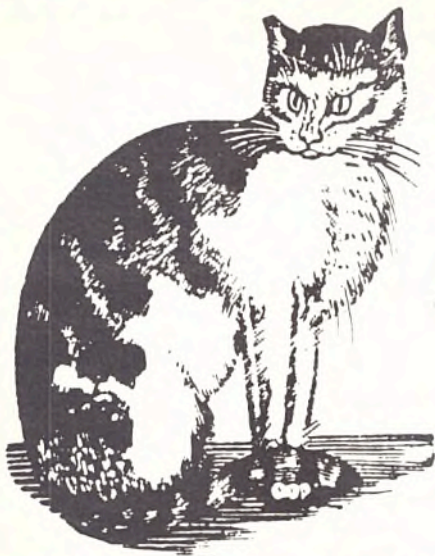
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other character sets. StarView supports several 8-bit character sets. Zinc has a Unicode version that works with any printable language in the world (given a fully populated font). StarView lacks Unicode support, but it does have the extra capability of saving string resources for multiple languages in a single resource file, to support dynamic switching between languages. So, if your program will be used in a multilingual place where all languages use a Latin alphabet, StarView would work well, while Zinc would be ideal for East Asia (although with one language per binary).

### Helpless

Help support ranged from non-existent in zApp, to incredible in StarView and XVT. Both of these provide the necessary tools to use identical hypertext help source on all platforms. In between are Zinc, which supports simple help (no hypertext links) on all platforms and C++/Views, which only supports help on the MS-Windows platform.

### Prince of the IDE

As you could surely tell from reading last month's article, by far the best development environment was the class browser/creator/editor/resource editor of C++/Views. It was meant to replace whatever IDE came with your Windows compiler. With just a few tweaks, it could. The zApp factory came in second, not indicating any lack of features, just that C++/Views Constructor was so good. For that matter, it has some features over Constructor. For instance, you can install third party Windows Custom Controls. Still above centre is Zinc's DesignEd, most notable for the fact that it comes in source code form and is itself written in Zinc. As one of the people from Zinc said 'Porting our own commercial application (over 30,000 lines of code) requires our application framework to be completely portable.'

### Perfect by design

In overall class library design, my mind is tied between zApp and C++/Views. StarView requires using too many `switch` statements when handling some events. XVT still has the feel of a class wrapper over a C library and Zinc, well... Zinc's design is fine, but I still can't manage to get comfortable with classes named `UIW_POP_UP_MENU...` Doesn't that look like a `#defined constant` I wonder? Overlooking that small point, I could easily put Zinc into a very close second place behind the tie for first.

### Technical wizards

When I began searching for GUI class libraries, one of the criteria I was considering rating was tech support; in particular, whether support was available by email. Unfortunately, I can't make that comparison, because *all five* companies offer support by email. Interestingly, most of them prefer it to all other forms. As with most development systems, free support is limited and extended support is available by arrangement with the company.

One nice touch that two of the companies have is an ftp server on the Internet. This makes picking up patches much easier and also allows the vendors to offer additional services. Inmark, for example, keeps copies of the latest version of the GNU C++ compiler up for public consumption. Zinc also has an ftp server with lots of Zinc related stuff available. The other three companies do not yet have an ftp server, although at least one (Star Division) is working on it.

### The bottom line

All five companies have different pricing strategies. XVT is definitely the most expensive, at \$1,950 per platform-seat for Windows/Mac/etc and up to \$6,300 per for various Motif platforms.

C++/Views Constructor is priced at £1,295 per platform-seat for Windows/NT/Mac and OS/2, £2,495 for Motif platforms.

Zinc and StarView are the least expensive, at around \$500 for Windows versions of Zinc and £299 for the Windows version of StarView. Zinc for Motif costs about \$1,500. Zinc has the added perk of giving additional Motif platforms after the first at just \$500.

zApp's pricing is a bit difficult to define because it also sells the class library, the development tools (zApp Factory) and a set of extra controls (zApp Interface Pack) separately. A package of all three for Windows is around \$1,000, and about \$3,000 for the same on X/Motif. It is possible to save some money here by buying only the class library (and possibly interface pack) for all plat-

forms other than the one used for initial development.

Zinc, zApp and C++/Views include source code, while StarView and XVT Power++ charge extra for source. None of the packages have any extra run time license fees.

Keep in mind that most of the prices I give here are US prices for comparison only. The price in the UK will be different (but probably proportionally similar).

### The best?

Unfortunately for those who want a definite answer, there is none. Which package you choose will depend on your priorities. My personal choice for an upcoming application will be either Zinc or zApp, depending on what word I get from our marketing dweebs about how much support is needed for other languages. Although both lack in different ways in the area of online help, I plan to use a Mosaic viewer for help anyway.

### A different tack

As I mentioned previously, there is more than one way to solve the multi-platform development dilemma. At the opposite end of the spectrum from C++ class libraries are run time environments such as DOS Merge on Unixware, and WABI (Windows Application Binary Interface) on Solaris (both Intel and Sparc), which take a normal Windows application straight out of the box and run it in an emulator which interprets the 80386 instruction set (if necessary) and translates all Windows API calls into one or more calls to Unix and X-Windows. Of course you pay a considerable performance penalty (especially in the case of WABI on a Sparc).

Somewhere in between are what I call 'Windows API Translators'. A developer recompiles standard Windows source code on the target system with these libraries and gets a native program which calls the API translator's dynamic libraries (much as happens with real MS-Windows) to convert Windows API calls into Motif calls. In contrast to the class libraries above, which would require a complete rewrite of any existing Windows application, an API translator library can be a big help if you have an existing application that was written to the Windows API (or Microsoft Foundation classes, or presumably OWL, although neither of the products I found explicitly supported OWL) and want to get it running on Unix with a minimum of effort. You may also choose to use it for developing new applications, as developer tools for Windows are so plentiful, and the Windows API and MFC seem to be turning into solid standards. In particular, now that Microsoft has MFC for the Macintosh, one could use



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# Wind/U versus MainWin

## Commonality

Both libraries come with a set of utilities to translate source code from DOS to Unix (ie making filenames lower case, changing backslashes to slash, removing C++ // comments from C source files). Both generate a skeleton make file and compile resources and help files. Both have some of their functionality in code that is linked with the application, and some of it in a shared library (like a DLL in Windows). Both support SunOS 4, Solaris 2, HP-UX 9.0, IBM AIX 3.2, and SGI Irix 5.2, amongst other platforms. Both companies have entered into agreements with Microsoft that give them access to Microsoft source code to assure high compatibility with the Win32 API (and this agreement obliges them both to charge run time fees for applications compiled with their libraries). Both also include a version of MFC compiled for their library. Additionally, both support DDE as well as not supporting OLE (although both are working on OLE for a future version).

## Distinguishing features

In the differences category, the main architectural point of difference is the level at which the translating library taps into the Unix machine's windowing system. MainWin translates MS-Windows into X-Windows (the primitive system that provides basic graphic functionality in terms of drawing graphics and text on rectangular regions, and reporting keyboard and mouse events), while Wind/U translates into Motif (a higher level library written over the top of X-Windows, which provides widgets (the functional equivalent of MS-Windows dialog controls) and win-

dow management functions such as window dragging and resizing).

MainSoft claims that X is the basic common denominator for all Unix graphics display systems. Basing its product on keeps its developers (and you) from being subjected to major problems when the Motif libraries change in the future. It also points out that while Motif offers similar functionality to MS-Windows, it is different in architecture. By not using Motif MainSoft can make applications compiled with MainWin look and feel more like an MS-Windows application. It also has its own implementation of Motif-look widget-controls which can be substituted for the MS-look controls for those users who want all their applications to have a Motif look. This switch can even be a menu selection in the application.

Bristol argues that while Motif offers similar functionality to MS-Windows, it is different in architecture. By using it Bristol can make applications compiled with Wind/U look and feel more like a Motif application, which is what a Unix user will want anyway. It also points out that, because of the higher level of functionality in Motif (relative to X), it is able to add support for many things much more easily. For instance Bristol supports Kanji characters. However, just as MainSoft has a set of Motif-esque controls to make its usually-MS look into a Motif look, Bristol has a library that gives an MS-esque look and feel to a Motif application.

Both of these approaches have drawbacks and advantages. I prefer Bristol's though, since I believe that having all applications running on any given platform look and feel the same is much more important than having a given application

look and feel the same on all platforms. Even using Motif-like controls can still leave opportunities for annoying differences. For example, in MS-Windows, an edit control is selected when you click on it and is not unselected until you click somewhere else. However, in Motif an edit is automatically selected as soon as the mouse moves inside its boundaries and becomes unselected as soon as it leaves. More subtle differences might be overlooked in simulated Motif, while calling the real thing ensures total look-feel compliance.

Another small difference between the two is in printing. While both support printing to PostScript devices (which seems to be the standard in the Unix world), Wind/U can also print to a PCL (HP) printer.

Although both have support for Windows .HLP files, the help compiler and help engine are included with MainWin, while they are an extra cost option with Wind/U (\$2,500 for the development utilities, \$2,500 for the help engine).

## Pricing

This is another area of difference. While both charge about the same amount for runtime licenses (computed according to some obscure, complicated scheme, but working out to about \$70-100'ish per desktop), developer kit costs are quite different. Bristol charges \$9950 per platform-seat for Wind/U, and they will throw in the help system for no charge if you order three or more. MainSoft is much more reasonable - they charge \$5000 for the first platform-seat, \$3500 for the second, and \$2000 for each after that; and of course they include the help compiler.

MFC for Windows and Mac in concert with a Windows API Translator for Motif to create cross platform applications. I found two such libraries: Bristol Software's Wind/U and MainSoft's MainWin. Although similar in many ways, they also have important differences. The *Wind/U versus MainWin* box compares these two translation libraries.

Obviously these API translator libraries are much more costly than the class libraries, especially if you plan to distribute your application widely. So, when would you want to use it? Well, for example if you were Computer Associates and wanted to get a Unix version of Super Project on the market in an extremely short time. Recently it did

this, using its existing Super Project for Windows source and MainWin. Otherwise, if you are looking for something for doing new development, you'll probably want to look towards one of the C++ class libraries, unless Bill Gates is your cousin.

## Fare thee well

My experience this month in promising something I could not deliver is the final event in the saga that has led me to decide that I cannot simultaneously and successfully fill the roles of software engineer, EXE columnist, husband and pet owner. One of them must end. Since I happen to be quite fond of my wife, am having a blast with my

new job and am scared stiff of the wrath of a scorned cat, I have decided that, although I have enjoyed my time on these pages, I must give up writing at EXE, at least for now. I will however, still be happy to hear from any of you via email, will always have interesting (hopefully) C++ source code sitting at <ftp.morningstar.com/pub/cpp>, and may even show up here from time to time. Merry Christmas, and Happy NetScaping!

*Laine Stump is a software engineer at Morning Star Technologies in Columbus, Ohio. He can be reached via email as [laine@morningstar.com](mailto:laine@morningstar.com).*



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Database Operations	At Object Level	Must Write Code
Productivity	Increased	Reduced
Complex Object Performance	Excellent	Poor

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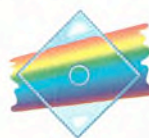
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# My Kind of Bookshelf - PART II

**Francis Glassborow**   
sifts through his  
mountain of publications on  
C/C++ and comes up with  
another selection of ideal  
tomes.

Since I recommended my ideal C/C++ bookshelf in the June issue of EXE the flow of new material from publishers has continued unabated. I now get about 25 books a month for review. Fortunately ACCU has a substantial panel of reviewers so I don't have to read them all myself.

Much of the output of the publishing industry is mediocre and some is so bad that it ought to carry a health warning: 'Following the ideas in this book could seriously jeopardise your future.' But among all the dross there are quite a few excellent books. There is certainly enough here to damage your bank balance.

## Flavour of the month

The newest, which will be published at about the time you read this, is *Safer C: Developing Software in High Integrity & Safety Critical Systems* by Les Hatton. As I did the technical review for this book (I've already been paid and I'm not on a percentage) I know its contents very well. I can thoroughly recommend it. Despite widespread opinion to the contrary, the author claims that C can be used in places that many think are the domain of languages such as Ada. He draws attention to two critical areas. The first is that C is well supported by tools which enforce good coding standards. The second is that experienced C programmers have thoroughly explored the fragile parts of C and therefore know what has to be avoided. Whatever your programming level, or interest in C, this book is well worth reading.

## Deep C fishing

I recently came upon two other books with a focus on writing high quality code. *Expert C Programming: Deep C Secrets* by Peter van der Linden is one of the most enjoyable books that I have read for quite some time. The author understands many problems that trap C programmers. He also has a sense of *joie de vivre* that, combined with an uncomplicated writing style makes this book outstanding. My copy was borrowed by Andy Koenig (author of the excellent C

*Traps and Pitfalls*) and crossed the Atlantic with him. He has since returned it, coffee stains and all.

The second book with a similar theme is *C++ and C Debugging, Testing, and Reliability* by David Spuler. David covers a broader and deeper canvas and handles his material well. The book is rather dry reading but it is valuable both for reference and to develop an understanding of the subject area. This is the author's third book and is definitely worth a place on any C++ programmer's bookshelf.

## CD is easy

Another book of tips for better programming crossed my desk earlier this year. *Jamsa's 1001 C/C++ Tips* by Dr Kris Jamsa. This is a perfectly respectable book but not in the same league as the two I have just mentioned. The reason I mention it is that the publisher (Debbie Jamsa) has recently released a CD *Jamsa's C++ Multimedia Trilogy* which couples this book with *Rescued by C++* and *Success with C++* all by the same author. The CD also includes about 45 mins of video and some sound clips. The beauty of publishing on CD of course is that the reader can cut and paste code as well as printing relevant sections as required. Spilt coffee is a worry of the past. I would like to see more publications in this format.

Moving on to something different, I would like to draw your attention to *C++ IOStreams Handbook* by Steve Teale. You might consider it expensive for a single topic book. Particularly one that concerns any aspect of C++ whilst the language is still in a state of flux. However it is a well written book and the author understands his subject matter, having implemented that library for a commercial compiler. If you are involved with designing classes that use any form of I/O this is a book you should read.

Just how many problems can be caused by a language being in a transitional state is highlighted by the eventual publication of the long delayed *The Draft Standard C++ Library* by P J Plauger. I took the author to task over the original title of this book:

'Playing God' is about using REND386. The general opinion of the ACCU committee is that with a name like that I should be the author.





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which was minus the 'Draft'. I am glad to see that the title has been amended. The book is excellent and, as you would expect from Bill (I've no idea how Bill is derived from PJ), it is written with authority. Nonetheless I expect that there will be substantial changes to some parts of the Standard C++ Library. A major factor is the vote earlier this year to include a Standard Template Library based on long term development work by Hewlett Packard. However, whatever the final form of the Library itself, this book is one from which serious programmers will surely benefit if they take the time to dip into it regularly.

### Exponential C++

I am told that the number of programmers using C++ is doubling every six months which probably means that there are now enough potential readers for *Taming C++* by Jiri Soukup. This book tackles two tough but vital C++ problem domains; mutual interaction between classes and persistent objects. His treatment of the former by pattern classes is an excellent introduction to this recent addition to programming methods. It is definitely not for the newcomer or anyone who is just dabbling with C++ and object orientation. But the serious large scale C++ programmer will find the financial outlay and the time taken to digest it an excellent investment. If you want to get a good start on the next development in programming get this book.

When I was making up the list for my June column I was in two minds about including *C++ Components and Algorithms* by Scott Robert Ladd. I am glad I left it out because an updated and greatly improved second edition has just been published. The author has taken the opportunity to do a thorough rewrite in the context of templates and exceptions. If you want to learn how to code algorithms in a C++ style then this book would be a very good starting place.

### Balm for Borland

In June I deliberately avoided books that were product based. This time I am going to allow myself a single exception because so many programmers struggle with the horrific documentation that comes with OWL 2. *Mastering Windows Programming with Borland C++* by Tom Swan will do a lot to help such sufferers and is certainly worth reading before you give up on the product.

*Debugging the Development Process* by Steve Maguire is a companion volume to his earlier work *Writing Solid Code*. These books are both on my 'must read' list. Indeed, many managers outside the computing industry could also benefit by reading them. One of the author's main tenets is

Title	Author	ISBN	Publisher	Price
Applied Cryptography	Bruce Schneier	0 471 59756 2	John Wiley	£36.95
C Traps and Pitfalls	Andrew Koenig	0 201 17928 8	Addison-Wesley	£16.95
C++ and C Debugging, Testing and Reliability	David Spuler	0 13 308172 9	Prentice Hall	£19.18
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Debugging the Development Process	Steve Maguire	1 55615 650 2	Microsoft Press	£21.95
Expert C Programming	Peter van der Linden	0 13177 429 8	Prentice Hall	£26.50
Jamsa's C++ Multimedia Trilogy (CD)	Dr Kris Jamsa	1 884133 03 7	Jamsa Press	£39.99
Mastering Windows Programming with Borland C++ 4	Tom Swan	0 672 30312 4	Sams	£37.60
Playing God	Bernie Roehl	1 878739 62 X	The Waite Group Press	£24.99
Ray Tracing Worlds with POV-Ray	Alexander Enzmann, Lutz Kretschmar and Chris Young	1 878739 64 6	The Waite Group Press	£40.99
Safer C	Les Hatton	0 07707 640 0	McGraw Hill	£22.95
Taming C++	Jiri Soukup	0 201 52826 6	Addison-Wesley	£36.95
The Draft Standard C++ Library	P. J. Plauger	0 13 117003 1	Prentice Hall	£23.95

that you must ask the right questions. Traditionalists will be horrified by some of his answers. I think I would make it compulsory reading for all software developers.

Moving away from books focused on C/C++ and software development I want to take a few moments of your time to draw your attention to a couple of other areas.

### Censorship of the key

First there is an excellent book *Applied Cryptography* by Bruce Schneier. The source code is all in C. The author writes clearly and simply about a subject where his knowledge is outstanding. I have no doubt that the book will be banned in more than one country because governments resent citizens learning how to hide information. The only sad thing is that the software the author makes available on disk is restricted by arms limitations to distribution in the US and Canada.

### Presents and peace

Finally, as you will be reading this just before Christmas I thought I should point you to some books and software that are pure fun.

*Persistence of Vision - Ray Tracing* (POV-Ray) is a complete package for 3D ray tracing on a PC. Those who think that complex ray-tracing is the domain of Silicon Graphics machines are usually staggered when they first come across POV-Ray.

The main problem with these and similar programs is documentation. However, if

you look carefully at the shelves in specialist Computer Book departments you may spot some gaudy covers from The Waite Group Press. Don't be put off. WGP is rapidly making a name for itself as the publisher of superb books on using PD software and shareware. It also publishes quite a few titles of a more traditional type. The two most recent titles to cross my desk are *Playing God* by Bernie Roehl and *Ray Tracing Worlds* with POV-Ray by Alexander Enzmann, Lutz Kretschmar and Chris Young.

*Playing God* is about using the author's REND386 and the associated C/C++ library. It is fun to read even if the general opinion of the ACCU Committee is that with a title like that, I should be the author. *Ray Tracing Worlds with POV-Ray* is the third book from The Waite Group Press on using POV-Ray.

Both books include a disk with all you need to get started. Try one of these this Christmas and you won't regret it. Parents of teenagers wanting some peace could give a copy to the children... but not if they want to use their home machine in the near future. ■

*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.*



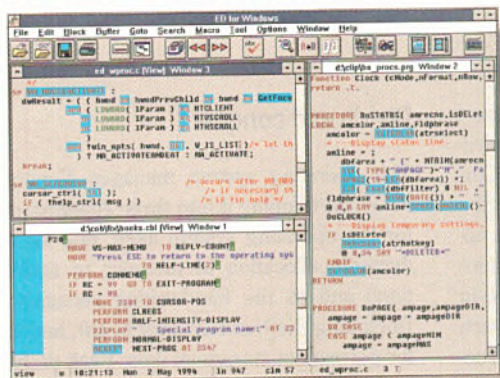
# Is your editor cramping your style?

IT'S SURPRISING how many programmers put up with those ho-hum editors bundled with their compilers. Or even DOS-hosted monsters which to be, errm, brief, haven't seen a proper upgrade since before Thatch left the throne. If you have ever found yourself picking through megabytes of material by hand to accomplish a task that you know should be a few keystrokes, then we have a suggestion for you.

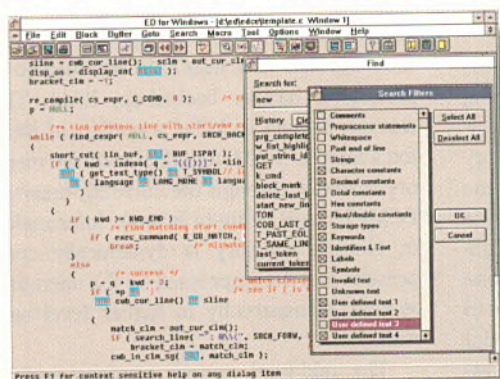


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Demo is fully functional, but won't let you save files > 2KB. \*\*The ED for Windows V3.0 demo ED3DEMO.ZIP can be downloaded from the QBS BBS (tel 081 747 1979, baud rate 2400-14400, connect 8 N 1, in the DEMO section), on CIX (topic qbs/files), from CompuServe (GO CLIPPER, library 8) and from ftp site CICA (demo directory) and its mirrors (eg src.doc.ic.ac.uk, computing/systems/ibmpe/windows3).



# Building Newton software

Personal Digital Assistants (PDAs) are often seen as toys for today's Yuppies. **Paul Smith** disagrees. He explains how the Newton OS works and how to write applications for it.



Enough has been written elsewhere about the Newton, so I won't dwell on the hardware itself other than to summarise. Currently there are four models. These are the original model (now on sale for £99), the updated model 100, the newer 110 (with more memory) and the 120 (currently on sale in Germany only). Message Pads have a touch screen, a PCMCIA slot, a network/serial/modem port, infra red I/O, copious built-in RAM and ROM, and an ARM Risc processor.

The most interesting thing about the Newton platform, at least as far as this month's column is concerned, is the system software that runs on it.

Apple describes three layers of Newton system software. These are the operating system and low level communications services, system services providing task-oriented support to applications and, at the highest level, a large collection of reusable user interface objects. Objects at the highest level incorporate NewtonScript code that applications can extend and override to customise their behaviour. NewtonScript applications cannot directly access the lowest level of the system software.

NewtonScript is an interpreted object-oriented language that has some similarities to the Self language. More on NewtonScript in a moment...

The lowest level of the system software, the operating system, is a preemptive multi-tasking OS. Different tasks handle matters like power management, data communication, inking (gathering pen input and marking the screen), memory management, task scheduling and inter-application communications. The communications subsystem, handles networking, serial, modem and infra red I/O. The operating system and communications system level of the system software is the only level at which there is any direct interaction with the Newton hardware. All higher level software functions including built-in and custom applications software, and the handwriting recognition system, run in a single Applications task that runs concurrently with the other tasks.

## Divide and conquer

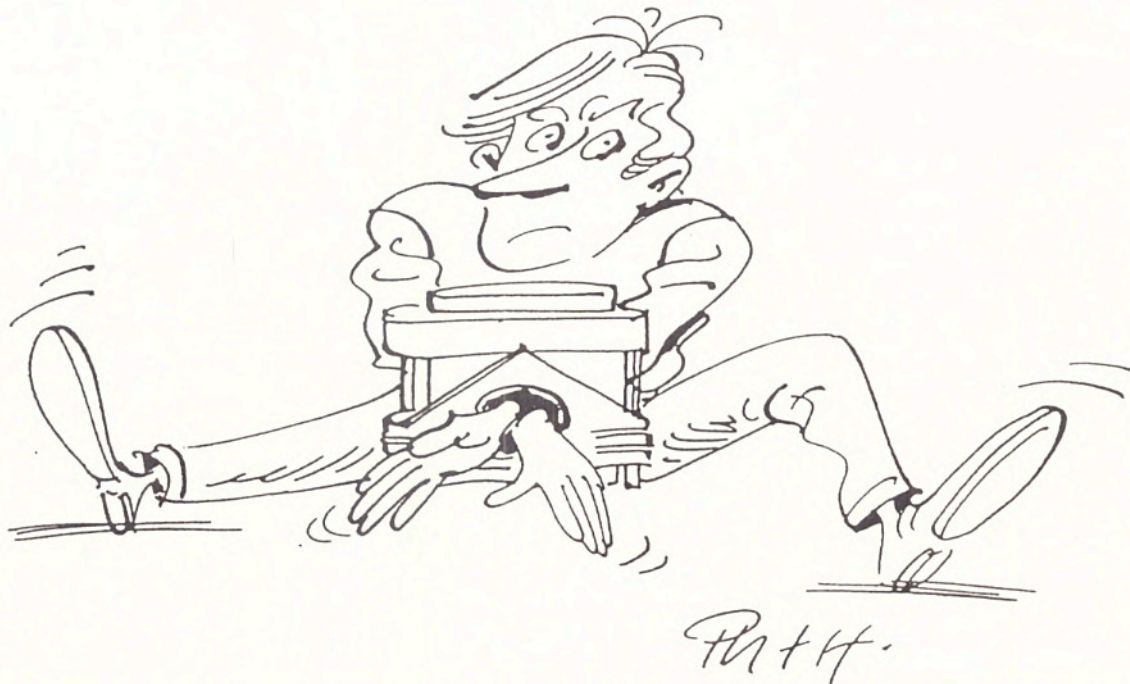
The operating system manages Newton's RAM, partitioning it into three *domains*: one for the operating system itself, one for the dynamic allocation of memory to applications and to the handwriting recognisers (including the NewtonScript heap), and one for permanent storage of data. Each domain has a distinct heap and stack. The NewtonScript heap is shared between all running applications and their objects. The system automatically handles memory allocation and garbage collection. The storage domain is special. It holds all the software packages installed on the Newton, together with all the *soups* that store user data. It is located in persistent, battery backed-up, RAM. The storage domain includes a portion of Newton's internal RAM, together with the memory available through the currently-inserted PCMCIA card (if there is one). Information in Newton memory is dynamically compressed and decompressed by the operating system, transparently to higher level software.

The mid-level system services encompass a wide variety of functions. The *Object Storage System* is the key to the whole Newton architecture. It is the most important of these mid-level services. All data stored by all Newton applications shares the same storage system and data format. The Newton is truly an object-oriented machine and applications that run on it integrate in a seamless way. Objects in the Newton are stored as structures called *frames*, each of which contains a number of named (tagged) *slots*. The content of a slot can be any NewtonScript value or object, such as executable code, another frame or a simple value. Frames can be resized dynamically, adding or removing slots. Related frames are aggregated into *soups*. More precisely, soups are indexed collections of frames which although they are related to one-another, do not have to contain the same arrangement of slots. Soup data can be interrogated by queries that track a *cursor* through the frames it contains, not unlike

Information in Newton memory is dynamically compressed and decompressed by the operating system, transparently to higher level software.



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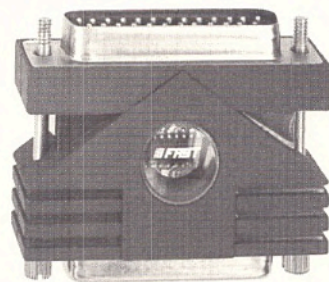
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the cursor in a relational database. Soups reside in *stores* which represent physical repositories such as Newton's internal RAM or the memory on a PCMCIA RAM card. A virtual soup called the *union soup* provides a logical view of all the data in all currently accessible stores, as if they were merged into one soup.

## Top of the iceberg

Most Newton applications are built from *views*, managed by another mid-level component, the view system. Views are rectangular areas, usually of screen space. On-screen elements are invariably constructed from views, which are defined by frames that specify attributes such as size and position. The view system provides a host of routines for composing, drawing, highlighting, scrolling, animating, opening and closing views. Views are tightly bound to applications in which every view descends from an *application base view*, that in turn descends from the system's *root view*. The middle level of the system software includes several sub-systems. The recognition system handles user input of shapes, handwriting, and gestures. The *intelligent assistant* service attempts to complete tasks by deducing what the user wanted to do. There is a high-level wrapper for the communications sub-system that abstracts and encapsulates connections in *endpoint* frames. And a set of imaging and printing services. Sound output supports playback of 22 kHz samples. Finally there is a reader for digital books created with the Newton Bookmaker,

global searching, a filing service for categorising soup data and a routing service that provides a universal in/out box for messaging.

The highest level of the system software is a large collection of *proto* objects that define attributes of user interface objects. Most of these *proto* objects live in ROM, although system updates and programmers can add new ones. They are referred to by instantiated objects at run-time, which can extend or override the prototype definitions they inherit. Constructing a new application out of views derived from protos is a rapid

process. This approach is one of the reasons why Newton programming is so easy compared to Macintosh or Windows development.

We're not done with views, yet. Applications are built up from a collection of views at runtime, but the application itself is made up of a static hierarchy of *templates*. These are frames containing a description of an object that may be instantiated. Slots in template frames can include behaviour, in the form of NewtonScript *methods* and data descriptions of attributes. Templates don't have to describe only view objects, they are also used to define communications objects and others that have no specific graphical representation. A view template is a special frame that inherits or contains some specific view-related slots, in addition to other slots as required by the programmer.

Templates are instantiated as view objects: the view is the visual representation of the object thus created. View objects inherit the attributes of their template prototypes which in turn may inherit from other proto frames. Once instantiated, run-time changes are made to the view objects and not to the template prototypes, which are read-only objects. Memory is conserved because only when object slots are modified, they are added to the view object. Otherwise they are inherited from the view's template (referenced through the object's *\_proto* slot) and from the view's container (referenced through the object's *\_parent* slot).

## The NewtonScript language

NewtonScript is a very interesting language. It was inspired particularly by the *Self* language created at Stanford University. Among its characteristics are small object

## The MacOS logo

Apple has created a new logo for the Macintosh Operating System, now called 'MacOS', and announced they are to license the OS to other manufacturers. Wider availability of the OS will be a good thing for Mac developers, since it should lead to a much higher installed base of computers that can run their software. Of course, it will also mean more machines to test the software on. At the time of writing, no product announcements have been made by licensees.

Apple is very keen that all Mac developers should show the 'MacOS' logo on their product packaging, advertising, and marketing materials, and all you need to do is sign a legal agreement and write a letter certifying that your product is *32-bit clean*. All modern Mac software should be 32-bit clean, by now. It means that the software must work in a 32-bit memory addressing environment, and most modern Macs only work in 32-bit mode. There's no fee to pay (except to your lawyer to explain the agreement), although Apple do ask for a free copy of your product. In exchange Apple will give you a CD containing artwork files and details of how the logo should be displayed.

All Apple developers who are members of the Associates or Partners programmes will have received the application forms for the MacOS logo. If not, send email to 'SW.LICENSE@applelink.apple.com' or to Apple UK Developer Services.

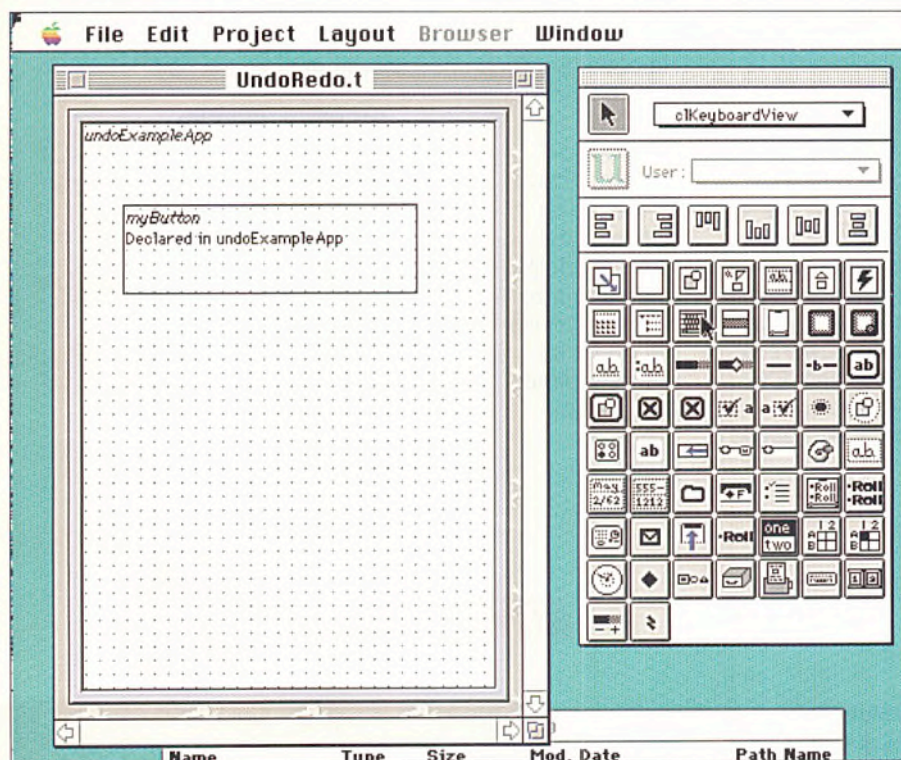


Figure 2 - NTK browser



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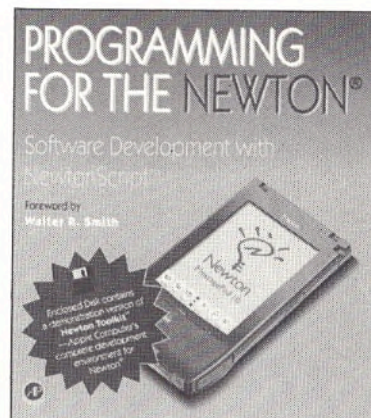
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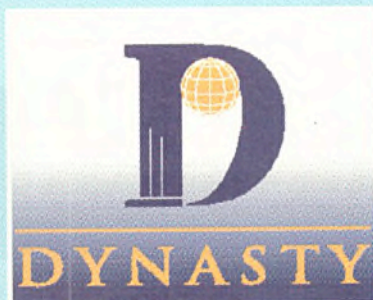
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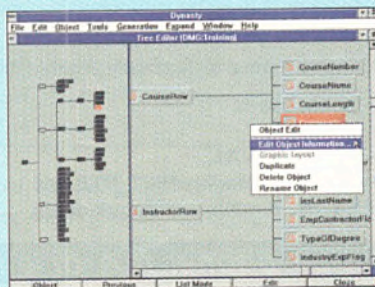


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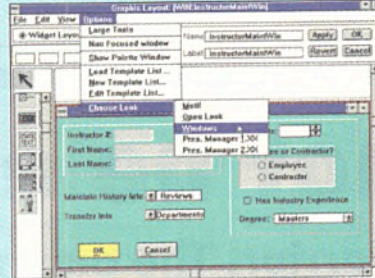


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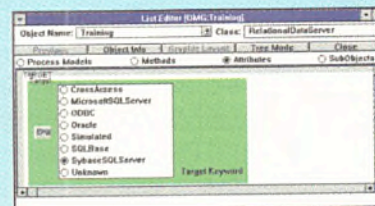
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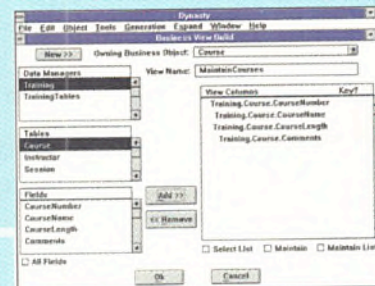
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code size at runtime, consistency and orthogonality of design, portability and great flexibility. NewtonScript is a small object oriented dynamic language. It's not a kitchen sink language behemoth-like the C++ that I (and most other developers) use in Macintosh projects.

Central to NewtonScript is the object model it builds upon. The object model of NewtonScript maps directly onto Newton's storage model, to which it is fundamentally bound. All data is stored in objects, which are constructed from two kinds of primitive value: *immediates* (32-bit immutable, constant and data) and *references* (32-bit pointers to other objects). Objects have a *class* and are derived from one of four primitive classes. There are immediates (boolean, character or integer constants), binaries (with arbitrary values from numbers through strings to pictures or sounds), arrays and frames. Arrays are ordered collections of objects. Individual array elements can be any class of object. Frames, described above, have the special characteristic that they are the only NewtonScript objects that accept messages. NewtonScript allows the creation of user-defined classes on top of these primitives.

Most NewtonScript code is encapsulated as methods. These are functions that are referenced by frame slots, executed in re-

sponse to a message. NewtonScript is compiled into a byte code stream which is executed by a runtime interpreter. This interpreter is concise, portable and allows the compiled code to be processor and machine independent. There isn't space to go into the syntax in this column, but if there's enough interest maybe we'll return to it in a later EXE.

### Development tools

Apple provides two main development tools for the Newton: the Newton ToolKit (NTK), and the Newton Bookmaker which is bundled in the NTK retail package. The NTK costs about £500. Various third-party tools are available, including a small number of Newton-based development tools. But the NTK is and will probably remain the primary means of constructing Newton applications. The Newton Bookmaker is used to compile rich text from a word processor and embed graphics in order to create electronic books.

The NTK runs on a Macintosh (you'll enjoy it more if you run it on a 68040 Macintosh, although it works fine on all Macs that have a 68020 or better, and on Power Macs). It integrates with a small Newton application called the Toolkit App, which provides package downloading facilities and allows the Inspector, NTK's debugger, to

connect to the Newton. NTK organises application development into *projects* (not dissimilar to Macintosh development tools like CodeWarrior or Object Master). Its output is a package which can be downloaded to the Newton. A graphical editor, illustrated in Figure 1, is used to compose views and create layout files that describe them. An integrated object browser (Figure 2) is used to set attributes and enter NewtonScript code. Since NewtonScript is a dynamic language, the integrated Inspector (interactive debugger) is used to examine and alter the application while it is running. A drawback of the NTK is that it is extremely difficult to gain a meaningful overview of a project and still be sure that you have examined everything that's important. A project-wide search and list facility are available, but this isn't really enough. Nonetheless, the NTK is highly effective and makes rapid application development feasible.

### Try before you buy

If you are dabbling, I wouldn't recommend that you start off buying the NTK. For an awful lot less you can buy the book *Programming for the Newton: Software Development with NewtonScript* by Julie McKeehan and Neil Rhodes, published by AP Professional. This book includes a disk of sample code which also contains a trial version of the NTK, to help you get started.

My primary criticism of the Newton and of its development environment is that it isn't completely finished. Many details are missing, incomplete or buggy. I am being unduly harsh in saying this, at a similar stage in the life cycle of the Macintosh computer the situation was worse. So, in summary I can confirm that what Apple says about the Newton being relatively easy to program and a good vehicle for rapidly developed vertical market applications is pretty close to the mark. I hope that Apple has the vision to develop the Newton concept fully. A new technology platform like Newton will take a few years to flower, but if it can stick it out I am sure the long term rewards will make it worthwhile.

In the meantime there is another new interface for developers! The manager of Developer Services at Apple UK is now Leigh Darby, who was previously responsible for developer training. He has also worked in the marketing department of AppleSoft (Apple's software division).

*Paul G Smith runs commstalk hq, a provider of strategic technology consulting and software development services. He can be reached via electronic mail at 'paul@ctalk.exnet.com' or by telephone at (01727) 844232.*

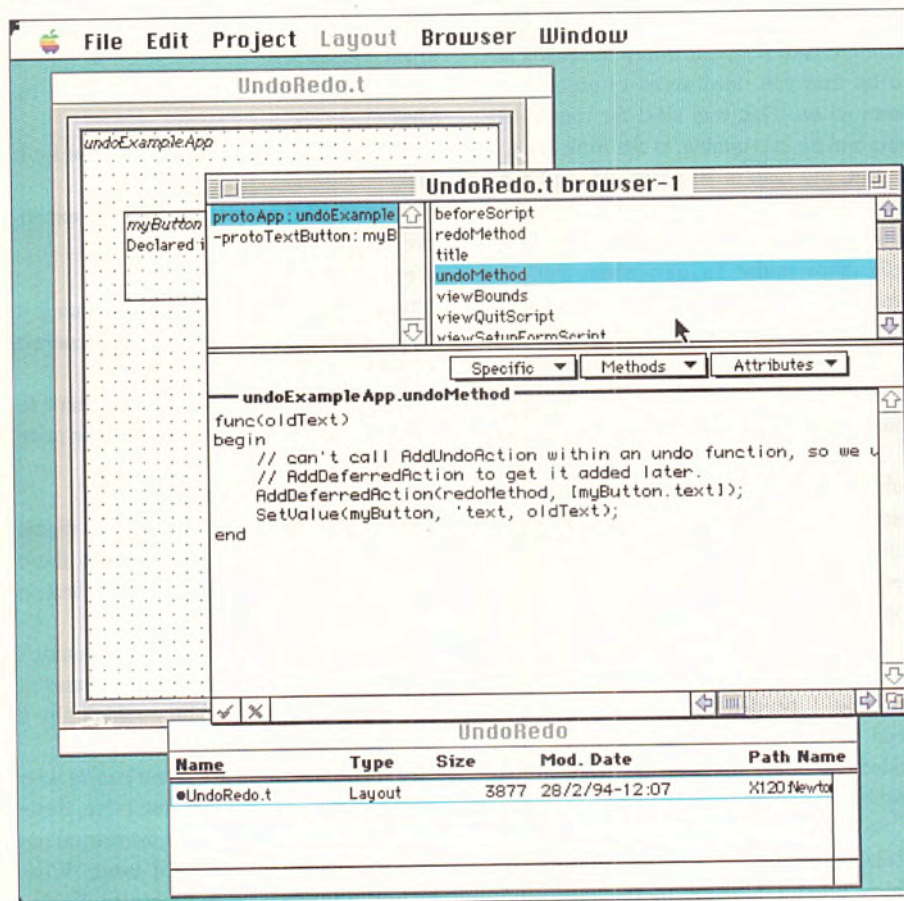


Figure 3 - NTK view editor



# Mayhem!

In 1925, Arthur Ferguson sold Big Ben for £1,000, Buckingham Palace for £2,000 and Nelson's Column for £6,000, all to American tourists. Of course, he never actually delivered.



Maps are interesting things. At first, you think you know what they are, but the more you look into them, the less it seems you know. For example, most maps are scale drawings of something geographical, but then there are maps which are not scaled pictures (such as the Tube map), and maps which don't represent geography at all, such as maps of communication routes, or maps of systems.

But all maps have one thing in common: they depict something more-or-less real. They are always about something else, even if that something is totally imaginary, like state transitions or Middle Earth. I've been thinking about maps since I tried to buy one. You would think it should be easy to buy a map, but I've been having real trouble with this one.

Let me explain. About 10 years ago, I bought the best map of London I've ever seen. It was a single, A2 chart, with Greater London on one side and Central London on the other. The roads were narrow lines, with annotations beside them; unlike the standard A to Z format where the roads are so fat that you need acres of paper to fit them all on. This was ideal for route planning and for rat-running, at the same time.

But, the map is 10 years old, and a bit out of date. So now I was trying to replace it. Esso, from whom I bought it, no longer sells maps under its own name, and the company that produced it originally was part of Maxwell's empire and had been sold since. The eventual buyers had killed the format, in favour of the more common fat roads style.

I spent days phoning round all the map publishers, trying to speak to anyone who might be able to help. Eventually, one person said to me 'I don't know why you've been put through to me, after all, I'm only concerned with digital maps.'

Ah, digital maps, now that's an idea! If I could get the data, I could print my own maps as I needed them. I also wouldn't need to worry about tearing them, as I folded and refolded, trying to get something usable. This could be the solution.

So he sent me information about the available products. A Windows program which printed bitmaps of the company's standard, fat-road maps (not what I wanted)

and raw data for roads, railways, water, and so on. This was what I wanted. This was the solution to my problem!

But no, it wasn't quite that simple. The bitmapped maps cost £700; the vector maps cost £22,000 - that's right, twenty two thousand. All that for a single-user licence, just for London, and the licence specifically prohibited republication. I phoned him back to confirm.

**I don't see that a map company based in Edinburgh can own the copyright to the streets of London.**

The prices were right. I probed.

'Why can't I just scan in your maps in order to get the bitmaps?'

'Well, that violates our copyright,' he replied.

I wasn't sure it does for sole use, but let it pass.

'How come the vector maps are so expensive?'

'We have to maintain that data.'

Actually, they don't; they're maintaining it anyway, because that's how they generate their paper maps.

'Ah, yes, that's true, OK we don't have to maintain them. Er, we're a third of the price of OS maps.'

Why are they *really* so expensive?

'Because, you can do more with digital maps. We can charge that because there are people who have no alternative but to pay.'

Charge it they certainly do; he wouldn't let me write my own program, and then run their data through it, and he wouldn't hire a CD to me either.

I don't think there are many people who could pay that, although at that price, there doesn't need to be many. But, he started me thinking about the copyright issue. What would the position be if I were to digitise this company's street maps into a vector







JAKE ABRAMS

form? What I would have would not be *its* map of London, it would be *a* map of London. I don't see that a map company based in Edinburgh can own the copyright to the streets of London. I can understand that a rendition of the streets of London is copyrightable, but now we're looking at, in effect, copyrighting look-and-feel.

So what of the digital data? Since its value is precisely the degree to which it accurately represents London, I cannot see that there is a significant creative work here. Consider; if I were to perform my own survey and come up with almost exactly the same data. I couldn't be violating their copyright. What, exactly, are these people copyrighting?

I concluded that they were copyrighting

only the format of the files. The underlying data is not copyrightable at all. This means they're charging £22,000 for property they don't even own!

Now, don't get me wrong. I do acknowledge that they have invested time and money in keeping their survey up to date, and I think that they should get a return on that. But, bear in mind that their main trade is selling paper maps, I wouldn't even have been talking to him had I been able to buy the map I wanted. I think charging twenty two grand is not only conning me, it is also conning organisations like the Police and the Fire service, who are the people who do need digital maps.

Autoroute proved that digital maps are an idea whose time has come, or at least is

rapidly approaching. Given the copyright issue, it won't be long before an organisation starts to digitise paper maps for sale at knock-down prices. That will leave companies like this one high and dry. It seems appallingly short-sighted for these companies not to sell their own maps cheaply, in order to grab the market before the competition arrives.

In the meantime, the spirit of Arthur Ferguson lives on. I'm sure he'd be delighted at the thought that someone can sell not just the landmarks of London, but its streets as well. ■

*Jules still hasn't found his map. When he's not entirely lost you can phone him on 01707 644185, or email him as jules@cix.compulink.co.uk.*



# The best of both worlds

Chris Sennitt of Rhino  
Publishing focuses on  
the 'Object' in Visual Objects.



One of the goals of Visual Objects (VO) was to produce an object oriented language that had all the best features of C++ and Smalltalk together in one product. C++ produces small, very fast native code applications that scream along. Smalltalk has a reputation for incredibly high programmer productivity due the flexibility and power of the language and rich class libraries. C++ derives its speed from the declarative, strongly typed and early bound nature of the language while Smalltalk derives its power and flexibility from its late bound nature, arrays and code blocks. C++ programmers must take care of memory management, a time consuming and error prone task. Smalltalk takes care of memory management automatically allowing the programmer to concentrate on the application and removing the errors associated with memory leakage.

VO has automatic memory management and garbage collection. It does early binding and produces native code when variables are typed (or can be inferred) and late binding otherwise. This gives programmers the best of both approaches. They can take advantage of rapid prototyping using the late bound features of the language. And for speed critical sections of code VO's strong type mechanism allows them to create native code. Visual Objects also inherits the array mechanism of Clipper (borrowed from Smalltalk), along with code blocks (also borrowed from Smalltalk). Code blocks are like pointers to functions in C++.

## Object syntax

Let us begin with the syntax used by VO to talk to an object. From the function definition in Figure 1 we can see that VO uses the ':' character as the send operator. The message on the right of the ':' is sent to the object on the left. If the result of a method is another object then we can send another message to it. For instance:

```
oPoint:up():up()
```

moves the point up two rows. The expression is evaluated from left to right. Before

we can run the code we need to define the point class as shown in Figure 2. This is defined as having two instance variables (properties), `nRow` and `nCol`. The `export` statement creates instance variables that are visible to everything: methods, sub classes and users of the class.

We then define the `up` method for the point class. When inside a method `self` refers to the object that received the message, in the same way that `this` is used in C++. The use of `self:nRow` inside the method is not required. `nRow` would do, but is recommended for readability. If there is no `return` statement at the end of the method VO automatically returns `self`. This allows the `oPoint:up():up()` mechanism to work.

As we can see from the definition of `oPoint:jumpUp()`, methods can take parameters. Such a method would be called in a similar way to a function.

```
// move up 10 lines
oPoint:jumpUp( 10 )
```

The method `init()` serves a special function similar to that of a constructor in C++. It is called automatically when the object is created. The code required to create a point now needs to be slightly different.

```
function start
  local oPoint
  oPoint := point{ 17, 23 }
  oPoint:up()
```

When the object is created with `point{17, 23}` the 17 and 23 are passed to `x` and `y` in the `init` method. The author of the class can now check whether the instance variables are initialised and perform any additional checking (bounds etc).

## Inheritance in VO

The inheritance model in VO is of the singular variety. This implies that a VO class inherits only from one parent, unlike C++ which offers multiple inheritance. Figure 3 is an example of the way in which we create

```
function start
  local oPoint
  // declare a local variable
  oPoint := point{}
  // create a point object //and
  // assign it to oPoint
  oPoint:nRow := 17
  // initialise the row
  oPoint:nCol := 23
  // and the column
  oPoint:up()
  move the point up one row
```

Figure 1 - Creating a new object and sending a message to it





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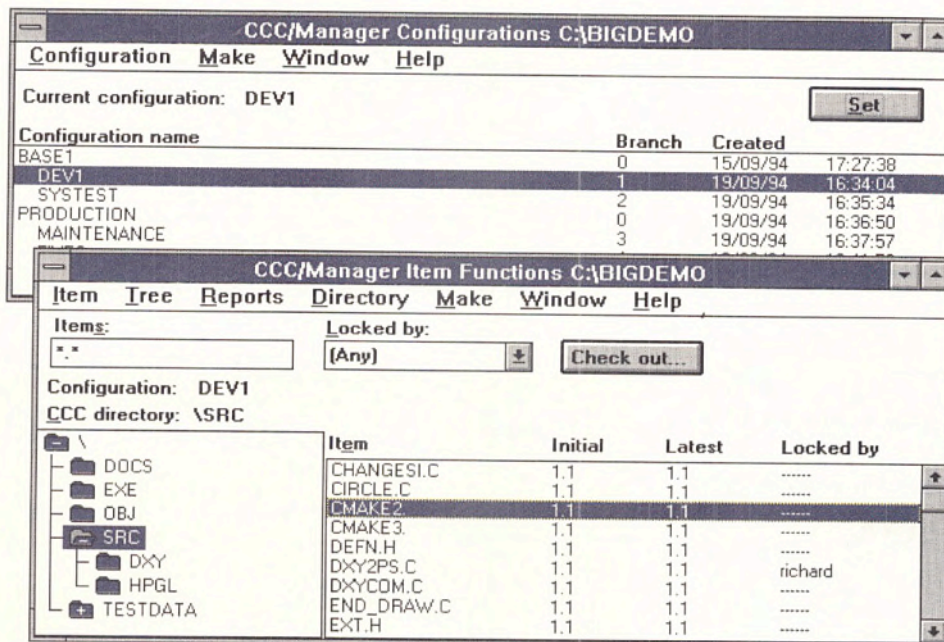
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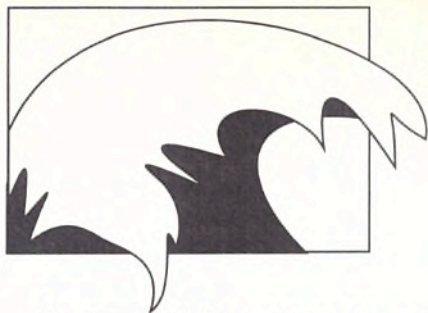
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```

class point                // declare a class called point
  export nRow, nCol        // two instance variables

method up class point      // define the up method
  // for the class point
  self:nRow := self:nRow - 1 // decrement the row by 1

method jumpUp( nLines ) class point
  self:nRow -= nLines      // VO has C++ operators -=, +=,
                          // /=, *=, ++, -- etc

method init( x, y ) class point
  self:nRow := x
  self:nCol := y

```

Figure 2 - Definition of class point

a threeD point with the additional depth field.

We also need to implement the initialisation in order to set up `dim`. The keyword **Super** overrides the normal method calling convention by calling the method belonging to the inherited class. This allows the programmer to code the additional stuff (like `nDepth` initialisation) and to utilise existing code. Calling the `super: init()` before doing anything else is highly recommended as VO does not automatically do this. Although it is more effort to call the parent's initialisation method explicitly it does make the language more flexible.

So far we have created new classes, inherited from them and added instance variables and methods in a completely open manner. The instance variables can be updated and accessed by the classes and sub classes methods and by users of the class. In larger applications, or in a programming team it is often desirable to limit access to instance variables. VO allows you to declare instance variables that can be updated within only the classes methods. A parallel in C++ would be private members of a class.

At the moment the user of the class can create an object but cannot access or update the instance variables. Everything has to be done through methods (see Figure 4). However, any methods in a derived class can also access and update these instance variables. For instance the `nAmount` member variable of `EmpPayRecord` is available to the derived class, `myEmpPayRecord` in Figure 4.

This class may now access and assign to the `nPay` instance variable, without thought to the Application logic. While this protection mechanism is easy to bypass, it does insulate the user of the class from so called business logic while allowing us to inherit and change that logic in a new class. This maximises the code reuse while giving some degree of encapsulation.

If we require a higher level of encapsulation then we can use hidden instance variables. These are not accessible to either the user of the class or any derived classes. Changing the class definition in Figure 4 as follows:

```

hidden cName
hidden nPay

```

will cause the `byPassChecks()` method to fail because it cannot access or assign to the superclass instance variables `nPay` or `cName`.

### Encapsulation

A lot of thought has gone into the implementation of encapsulation within VO. When using non-exported instance variables the use of methods instead of instance variable access forces the user of the class to be aware of the implementation of that class. This violates encapsulation because the syntax referencing a method is very different to that of referencing an instance variable. VO has mechanisms that enable access to these instance variables through special methods, called *access* and *assign*

methods. These methods place code wrappers around the real instance variables, allowing the programmer to control the access and assignment of these instance variables and hiding the implementation details.

In Figure 5 the user of the class may now access the `nRow` instance variable, however, they cannot assign it a value. The **assign** keyword in the `nRow()` definition is used to specify that this method is called only during assignment. Here, the user is allowed to assign a value but this is limited to the range 0 to 100. To avoid a recursive method call, references to the instance variable `nRow` inside the `assign` method go directly to the real instance variable.

Access and assign methods may be placed around any type of instance variable, exported, instance, hidden and protected. Protected instance variables are like instance variables but differ in the interaction with the access and assign methods. Within a method the access and assign methods for protected methods are not called. They are only called outside by users of the class.

This gives a dramatic increase in performance as protected will always be early bound (compile time) and instance is always late (runtime). Tests on the Pre-release (beta) version have indicated a three fold speed increase when using early binding as opposed to late binding. Figure 6 lists visibility and bindings of VO instance variable types.

### Strong typing

So far we have used VO in an xBASE manner where variables are dynamically typed, that is a variable may be an `int`, then be assigned a `float` and then a `string`. While this manner of programming is discouraged because of increased testing and debugging times, VO does fully support this mechanism. If, however, you use Hungarian nota-

```

class threeD inherit point // we automatically get the nRow
                          // and nCol instance variables
  export nDepth           // add the nDepth instance variable

method moveIn() class depth // add the moveIn method
  nDepth := nDepth - 1

method moveOut() class depth // and the moveOut method, both
                          // methods default to returning
                          // self
  nDepth ++

method init(x, y, z) class threeD
  super: init(x, y)      // call the inherited class init method
  self:nDepth := z       // then initialise nDepth

```

Figure 3 - Single inheritance



```

class EmpPayRecord
  instance cName    // these can only be accessed
  instance nPay     // and updated within the its methods

method init( cPerson, nAmount )
  self:cName := cPerson
  self:nPay := nAmount

method updatePay( nAmount )
  if nAmount < self:nPay +5000    // Application logic says
                                // cannot have more than a 5K
                                // pay rise
    self:nPay := nAmount
  endif

class myEmpPayRecord inherit EmpPayRecord

method byPassChecks( nAmount ) class myEmpPayRecord
  self:nPay := nAmount

```

Figure 4 - Restricting access to members

tion within your Clipper applications then moving your code to VO and utilising the optional strong typing is simplified.

```

class point
  export nRow, nCol as int

```

When the variables are strongly typed VO will not allow a value of the wrong type to be assigned. In the pre-release this gave a four-fold increase in performance. The optimiser can be switched to 'type inference on' without making code changes, giving a two fold increase in performance. The type inferencing technology built into VO allows it to scan all the places in which a function is called and its parameter usage. From this it can infer the type of a variable and generate the code accordingly. If your existing Clipper code is consistent in its use of parameters this type inferencing will be a real boon.

### Writing generic code

Because VO allows dynamic typing, it is possible to write completely generic code which operates on objects of very different classes. The code below will take any object that has an `up()` and `right()` method. This makes it possible to write generic code and helps with rapid prototyping.

```

function moveDiag( oVar )
  oVar:up()
  oVar:right()
  return( oVar )

```

You may help the compiler generate slightly better code by declaring

```

moveDiag( oVar as object )

```

Programmers wanting to create very generic code have a rich function list to work from. At runtime we can check whether a particular method can be sent to an object, or check if an object is of a particular class. We can find the class name, the number of classes available to the application, obtain a list of classes linked into the application in an array and get the class hierarchy of an object.

### Out with the garbage

In C++, if the programmer has allocated memory for instance variables then this memory must be deallocated.

In VO has automatic garbage collection is totally automatic. When objects or variables go out of scope the memory is released, more complex data structures can easily be constructed and the object is released only when it is no longer reachable. This leaves the programmer free to concentrate on the problem at hand, leaving the language and runtime system to collect the garbage. Very complex data structures of a dynamic nature may be built quickly and easily without thought to destructors or memory management. For instance a generic routine could be coded to load a record (say a customer) and all related records (say all invoices for that customer) into objects given the two data table names and the relation between them. The programmer could then use the same routine to load all line items for a given invoice.

Self referencing data structures may also be easily constructed. A data table object may contain an array of field objects. In turn these field objects could contain an instance variable with the data table object. Given a table object you may then find all field ob-

jects, given a field object you may find the table object. In VO, these will all get collected if the objects go out of scope. If however, only one field is reachable, then its table object is reachable (through the instance variable) and the table objects array of field objects is still available. When this field object becomes unreachable the rest become unreachable and the whole data structure will be collected.

If you place some resource in an instance variable that requires freeing, like a file handle, you can get VO to call a method automatically as the garbage collection routine processes that object. This method is called `Axit()`. Before the `Axit` method is called, we must obviously define an `Axit` method for the given class. Next, the object has to be registered with the `RegisterAxit` function. The object should then be made unreachable and a VO garbage collection should be initiated.

It is normal to register the object in the `init()` method. An object can be deregistered by calling the `UnRegisterAxit()` function. The programmer forces a garbage collection with the `CollectForced()` function. In general, VO will perform a garbage collection when memory is low or if the application is waiting for the user.

While this mechanism is not as predictable as C++, it is unusual for a normal business application to require a manual intervention for allocating and deallocating special resources. They will be used mainly by the third party suppliers who want their third party classes to be as easy to use and as bullet proof as possible.

### Very late binding

We have already discussed early binding (compile time) and late binding (runtime), VO has one additional mechanism which I call Very Late Binding. Very Late Binding

```

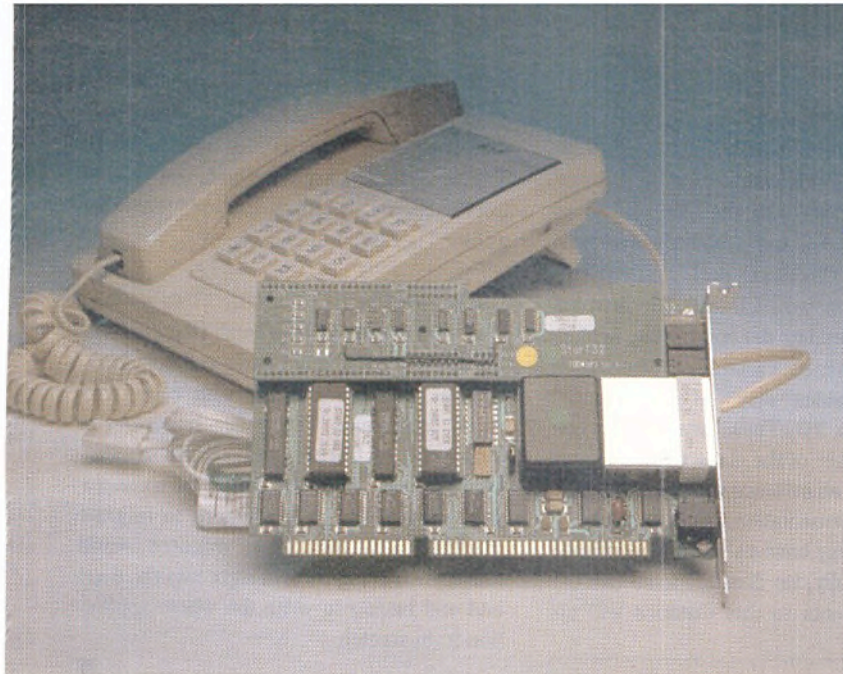
class point
  instance nRow, nCol
  ....
  access nRow class point
  return( self:nRow )

assign nRow( nValue ) class
point
  if self:nRow < 0
    self:nRow := 0
  endif
  if self:nRow > 100
    self:nRow := 100
  endif
  return( nRow )

```

Figure 5 - Bounds checking in assignment method





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occurs when a message is sent to a method that does not exist. If the class has a `NoMethod()` method, this will be called when the unknown method hits the object. There is also a `noMethod()` function, which returns the name of the method fired at the object. We may then do our own lookup and act accordingly.

If an unknown instance variable is assigned or accessed VO has a `NoIVarPut()` and a `NoIVarGet()` method.

A generic Table Class could be implemented using these mechanisms. When

```
static global nCounter := 1

class axitDemo
  var nVar

  method init class axitDemo
    registerAxit( self )
    self:nVar := nCounter ++

  method Axit class axitDemo
    // show the value of nVar as
    it gets destroyed
    ? self:nVar
```

Figure 7 - Freeing resources automatically during garbage collection

opening a table, a field list could be built. Access to the fields would then be through instance variables with the same name as the fields. Access and assigns would map onto the `NoIVarGet` and `NoIVarPut` methods. These would lookup the field list and return or update the appropriate field.

Virtual Instance Variables or calculated instance variables may be implemented trivially within VO. These are useful when the programmer of the class wishes to give the illusion of an instance variable while hiding the implementation. For example, a point object may have an x and y coordinate and, additionally, its distance from the origin. Assignments to this distance will up-

```
class point
  export x, y

  access distance class point
  return sqrt( x*x + y*y )

  assign distance( nVal ) class
  point
    self:y := self:x := sqrt(
    nVal * nVal / 2 )
```

Figure 8 - Implementing a 'virtual' distance variable

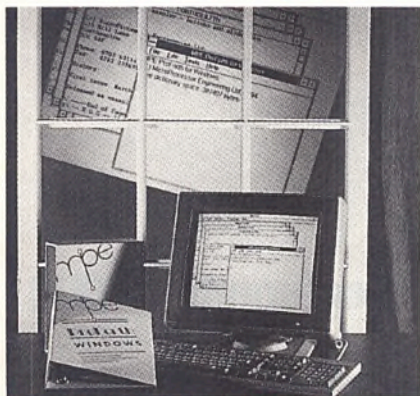
date the x and y coordinates automatically. The access and assign methods are used to implement these virtual instance variables as listed in Figure 8.

## Conclusions

One other feature of Visual Objects over Smalltalk is the ability to mix traditional procedural techniques freely with object oriented techniques. There are hundreds of thousands of Clipper and xBASE applications around. Allowing a mix of technologies enables the programmers to migrate gradually into the object oriented world rather than being thrown right into the deep end and having to write the whole application from scratch.

Chris Sennitt may be reached at Rhino Publishing on 0302 371 711 or on Compuserve on 100012, 3253. He worked for Ashton-Tate, Nantucket and Gupta before starting his own business writing and selling Programming Productivity Tools. Rhino is a CA-Business Partner (selling and supporting Visual Objects) and the only UK Visual Objects Training Partner in the UK. It currently runs Computer Associates' Visual Objects Training courses as well as its own on-site and one-to-one training.

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# Good looking data

The road from raw databases to glossy reports is paved with report generators. **David Mery** looks at the potential of three Windows tools.



Data is an organisation's most valuable asset. Yet it may as well be garbage without some way to turn it into meaningful information. The switch from raw data to actual information is the delicate link between the developer community and the user community. They, that is the users, need us to get at their data. We would like to think that without us all would be lost. No longer would they be able to interpret the information. Quite simply, they would be stuck with a DBF (or whatever file format). One would hope we are, in fact, the organisation's most valuable asset. We are the people who take their data and present it in a form that would grace any boardroom.

Today there appears to be a worrying shift in emphasis from the developer to the user. Give them the power to decide what they want. We have already witnessed the demise of traditional data processing. And PC databases are undoubtedly becoming easier to use. But producing complex reports is still beyond the capabilities of most users today. So, for the foreseeable future, there is likely to be a need for people with a skill at creating database reports.

But which tools will they use I wonder? Microsoft, for instance, doesn't sell a report generator. It considers that Access can do the job just fine. Nevertheless, there is still a need for specialist tools. One reason is that they address different markets to database front ends. If you're in an organisation which uses different database servers or which receives database files from different origins, that's where a report generator becomes handy.

We have looked at three report generators in the article, all working under Windows. These are ReportSmith version 2.0.2a for SQL and PC databases, the final beta of R&R SQL version 6.0.15 and WinQL SQL v. 2.00b.

## Data formats

As can be seen in Figure 1, they all support most popular PC database formats. ReportSmith and R&R use ODBC to access all file formats while WinQL uses native drivers for PC databases. According to the documentation R&R and WinQL also support several index formats such as NDX, MDX, NTX, IDX and CDX for R&R, and K?, NDX, MDX, NTX, IDX and CDX for

WinQL. It is difficult to ascertain the extent to which the three products made use of indexes. In fact in a very rough experiment I performed, there was no perceivable performance improvement when sorting on an indexed field.

The situation is different regarding SQL database server support (see Figure 2). R&R has a clear leading edge on the number of formats it can cope with, just out of the box. In the next minor release of ReportSmith, version 2.0.3, Borland will ship an IDAPI driver to access dBASE, Paradox and Interbase files.

Since all three support ODBC it is possible, of course, to obtain ODBC drivers elsewhere. In which case any SQL database can be accessed so long as an ODBC driver can be found.

## Not exactly fast...

I used the report generators on a 486DX-33 with 16 MB of memory. On that machine performances felt sluggish. For instance a report of 6,572 records with four fields displayed took about 1'10" to be printed in a Window with ReportSmith, 1'53" with R&R and 8'20" with WinQL. Sorting this same table on the first field took 3'58" with ReportSmith, 4'42" with R&R and 8'33" with WinQL.

You have to bear in mind that the version of R&R we used is still a beta. Timings were done by hand and so are not very precise. So, they're probably fast... if you're running a twin-Pentium with 32 MB of memory! But, while they appear to be rather sluggish on reasonable spec machines, they do produce good looking reports. Do not try to run a communication session at the same time as a report generator though, as the connection will be lost.

A common lack in the interface of these programs is the absence of a clear indication of the progress of each command. Often operations fully use the CPU (clock stopping), with only a cursor indication that something is happening.

When you don't have much faith in Windows, you end up wondering whether it's just a slow operation going on or if Windows has crashed. ReportSmith does give time estimates for certain operations but there are still too many operations with no other indication than a cursor change.

	ReportSmith	WinQL	R&R
ODBC	✓	✓	✓
Access	✓	-	✓
Btrieve	✓	✓	✓
Clipper	✓	✓	✓
DataFlex	-	✓	-
dBase/xBase	✓	✓	✓
Excel	✓	-	✓
FoxPro	✓	✓	✓
Object Vision	-	✓	-
Paradox	✓	✓	✓
PowerFlex	-	✓	-

Figure 1 - PC databases



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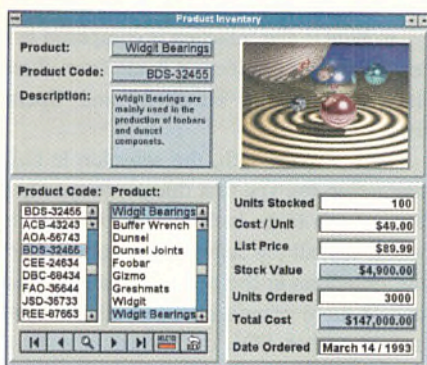
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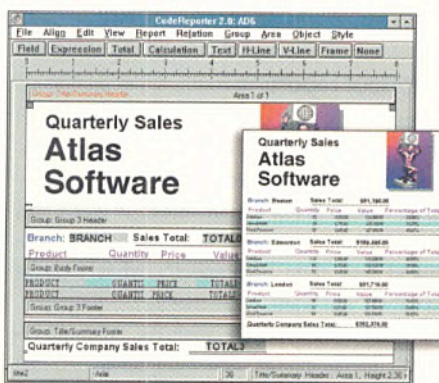
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	ReportSmith	WinQL	R&R
AllBase/SQL	-	-	✓
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DB2/2	-	-	✓
DDCS/2	-	-	✓
Image SQL	-	-	✓
Informix	-	-	✓
Ingres	✓	-	✓
Interbase	✓	-	-
MDI Gateway	-	-	✓
Netware SQL	-	✓	✓
Oracle SQL	✓	✓	✓
Progress	-	-	✓
SQL/400	-	-	✓
SQL Server	✓	✓	✓
SQLBase	✓	✓	✓
SQL/DS	-	-	✓
Sybase SQL	✓	✓	✓
Teradata	✓	-	✓
Unify	✓	-	-

Figure 2 - SQL databases servers

### Who generates report generators?

Borland's ReportSmith was originally developed by Indigo Software Corporation in 1992. This company then changed its name to ReportSmith Inc before being acquired by Borland in June 1994. ReportSmith has some portions licensed from Ocelot Computer Services, Microsoft, SoftBridge, Arthur D. Applegate and Q+E Software. Version 2.0 was launched by Borland soon after the acquisition of ReportSmith.

R&R is sold in the UK by R&R Software Ltd but the software was written by Concentric Data Systems. The relationship? R&R is a subsidiary of Concentric Data Systems which was founded in 1979. The first release of R&R appeared in the Winter of '83. It was for Lotus. Support for dBASE came in '85 and for SQL in '92. R&R for Windows was first released in '92. Version 6 of R&R contains code from Q+E and Accusoft.

WinQL is copyrighted by Core Software with portions licensed from Crystal Services and Data Access. Core Software and Data Access have a long lasting relationship since Core Software has been the Data Access developer for thirteen years. Core Software is primarily a development company. This is why international distribution of WinQL is done by Data Access. Back in 1992, Core Software felt the need for a high level report generator to pass data between DataFlex and Fastrack, an inventory tracking software, so it licensed an OEM version of Crystal Report for internal use only. After realising the potential of such an application

it enhanced it to make it more appealing to DataFlex developers and sold it through Data Access.

### Two perspectives

Not all report generators work the same way. R&R and WinQL both present a window in which you set the fields wherever they should be printed and then print in another window or on a printer. When you print to a window in R&R you have to wait until it processes the whole database to move between pages. In ReportSmith the two steps are somewhat blurred. You work directly on the result, on the real data presented exactly as it will print. I found this way more efficient than the modal approach of the two others products where there's a need to go back and forth between the view window and the edit window.

they're probably fast... if  
you're running a twin  
Pentium with  
32 MB of memory!

### Shortcut reporting

WinQL has two options: 'new report' and 'new mailing report'. The former is a columnar report. The screen then shows an empty area where fields are inserted. In R&R and ReportSmith, you first select the new command and then you specify what type of creation you want.

R&R offers 'report wizards', 'instant report', 'blank report' and 'templates'. Instant means simple columnar report with all fields inserted on one line. The standard wizards in the beta we had provide relatively simple step by step report generation. More wizards should be available when version 6 ships. Also Open Scripting, the way to develop wizards, will be documented. Crosstab reports or pivot tables, which looks like spreadsheets, can be generated through OLE automation within Excel.

In ReportSmith, four main styles are available. These are columnar, crosstab, form and label. The form style is for creating letters with only one database record per page. For each of these a default style is selected unless you click on the style option to select a different one. In addition, since ReportSmith works directly on the database data, a draft mode enables the software to work only on a subset of the database (eg the first 100 records). Also 'wallpaper' can be printed as a background for the report.

### Happy with labels

As expected, Avery, the most common brand name of label, is supported by all the report generators. In fact R&R has the definition of 172 Avery labels, ReportSmith then follows with 54 and WinQL with 34. When you're unlucky and the type of labels you're using is not predefined (and you don't want to change to another type of labels which is referenced by the software), you can create a new type with all three report generators. That means measuring label sizes, space between them, size of the page and order in which you want them to print.

### Top, bottom and middle

The three report generators all structure the page in a very similar way, if not described with exactly the same terms. From top to bottom these are the title, page header, group header, details, group footer, page footer and summary.

The detail section holds the information which is repeated for every record selected from the database. But if you group information, then it is the group that will go in the detail section. For instance, for a database of contacts, if the report is grouped according to company names then contact details for all the people you know in a company will be in one detail section. That's when group header and footer become handy. They can hold summary information for the group, like the number of contacts per company in our example.

### Selecting fields

The three report generators let you create a selection associated with a report. They all provide a point and click interface making things very easy. In R&R, selections are called filters. They are made of one or several lines. Each line is filled by selecting items out of six combo boxes: 'and/or' (relation to the previous line), '(' (parentheses if necessary), 'Field', 'Comparison', 'Compared to' and ')'. I find it rather primitive.

In WinQL the selection is composed in a text window by selecting items from three list boxes: 'Fields', 'Functions' and 'Operators'.

With ReportSmith, the selection is built hierarchically. The first thing is to specify if the records to be included are the ones to which any, all (by default), none or not all of the criterions in the next lines apply. Then one or more criteria have to be built. They can be either SQL or normal selections. When building an SQL selection, three list boxes are present: one to select a field or a variable, one containing operators and statements and one for functions. The query is made by point and click. To create a normal selection a line is presented to the user. It is



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New features in both Crystal Reports Standard 3 and Pro 3 versions include:

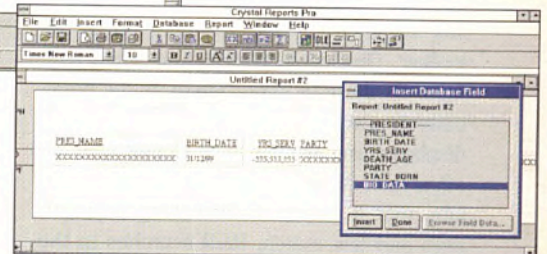
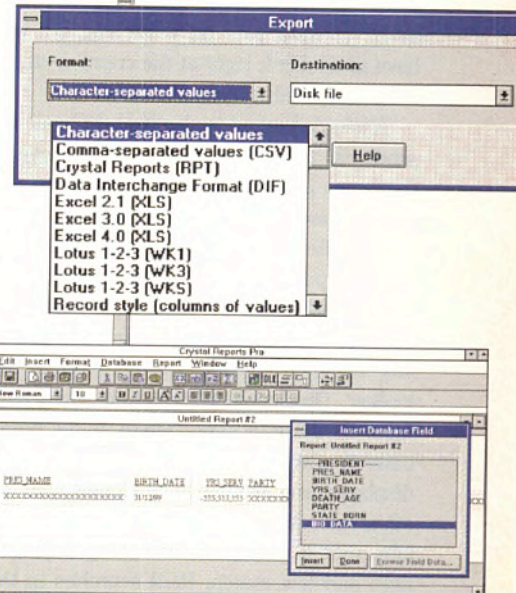
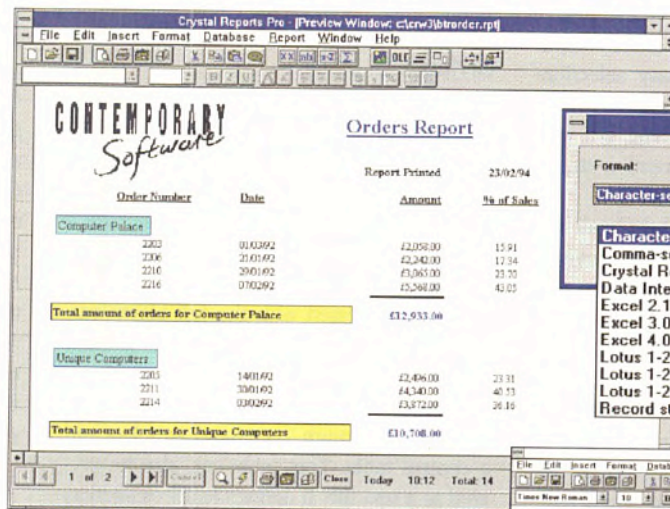
- ▀ **Fine Tuner** for tweaking the "look" of a report in the Print Preview Window.
- ▀ **Data Views** give intuitive field names and can hide formulae and links.
- ▀ **Drag & Drop, Formatting Ribbon + Selection Lasso** to speed report design.
- ▀ **Mail support (VIM, MAPI)** distributes reports via e-mail.

- ▀ **Cross Tab reporting** allows spreadsheet-style comparative analysis.
- ▀ **More PC data access** - Use the same intuitive interface to query/report on all supported databases: ASCII, Access, Excel, DB2/2, dBASE, Paradox and Btrieve.
- ▀ **OLE 2.0 compatibility** - include graphics, text or tables from other software.
- ▀ **Two pass reporting.**
- ▀ **Export formats** facilitate information transfer. These include RTF, WordPerfect, Word, Excel, Lotus 123, etc.
- ▀ **Integration with Crystal Reports Server** removes report processing and so frees up your machine. And you can schedule reports to be printed after hours or automatically.

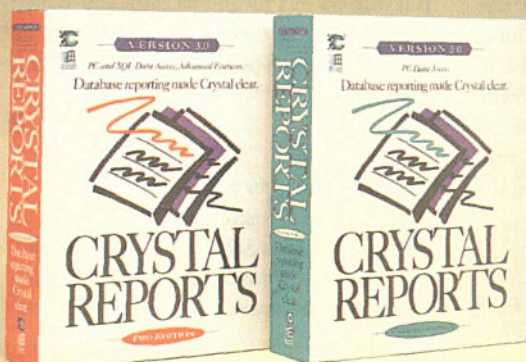
Additional features in the Pro 3 Edition include:

- ▀ **Free copy of TrueGrid 2.**
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- ▀ **Dictionary builder** for building data dictionaries in simple Data Views.
- ▀ **30 extra Print Engine Calls** for optimal report production at runtime.
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then possible to click on any element of this line to change it. The first one is to select a field or a formula, the second one is for an operator and the last one is for a function, a field or some data.

The SQL queries generated can be viewed and copied in the clipboard. Only ReportSmith allows you to modify the SQL directly. However, if you do modify then you cannot go back to the easy selection mode. Going to SQL entry is a one way ticket. In R&R you can write SQL but you have to decide it right at the creation stage. It's a completely different process.

A join command is also present in all the products, to get information from several databases in one report. First step is to add the databases needed. Second step is to link relevant fields. Then to organise the fields on the report. In fact with ReportSmith it is also possible to proceed graphically by opening two reports, selecting the fields to link and then clicking the link icon on the toolbar. One convenient option when adding a database in ReportSmith, is the possibility to exclude fields which will not be displayed and are not used to link with another table. R&R can create an approximate join, that is, a join where by specifying a high and low match, R&R searches in the 'linked to' table for either the nearest higher or lower related value.

## When you need more

If all the information you need in your report is in one of several databases then the report can be built mainly with point and click actions. But when calculated or derived fields are needed, not all report generators provide the capability in the same way. With the three reviewed it is possible to do some arithmetic, relational, logical and string calculations. They also all have more specialised functions working on dates and ranges for instance.

R&R is definitely aimed at developers. In addition to its built-in operators and 91 functions it can call an external function defined in a DLL through a special function CDLL(). WinQL works in a similar way. It includes operators and 71 built-in functions. Also developers can create DLLs containing 'user defined functions'. When these DLLs are put in the WinQL directory, functions are automatically recognised.

ReportSmith gives another option by including a macro language called Report-Basic. It's a Basic language with DDE and OLE2 support licensed from SoftBridge. Borland has added 58 commands, 36 methods and 12 properties for report generation to the set of 178 statements and functions of the original Basic language.

The three report generators reviewed

contain a rich set of functions. But the problem is not the number of functions but whether they are needed for your specific development. The language approach of ReportSmith gives the greatest flexibility while maintaining ease of use. But if you're not afraid of developing a DLL then they're all as powerful.

## Giving it all away

Once a report is created, you may need to distribute it to others or you may need to develop an application which, amongst other things, generates reports. In order to do so the three report generators include a runtime that can be re-distributed without any fee.

Reports created with the full blown version of R&R can be displayed or printed with a runtime executable. This program can be distributed freely. The runtime is configured through command switches and a control table. This table can also be created as a text file. It defines features such as user-defined parameters or filters. The runtime can also be interfaced at the DLL level or through VB custom controls. The simplest VB program in the manual is:

```
Sub Command1_Click()  
cmd$="c:\rsw\rswrun.exe_  
/TTC:\rsw\rrsample\rswrunin"  
i%=Shell(cmd$,1)  
End Sub
```

A runtime control file is used to set the report query.

Runtime creation in WinQL is the simplest of all. In the file menu there's a command called 'compile report'. It does just that. It creates an executable file that will print the report to a window, a file or on a printer at a specified time. It can hardly be simpler to use. A developer's kit gives control at DLL level but it is an additional product. Another package, the Visual Basic Setup kit which is included in Professional Edition, installs VB custom controls enabling you to control the runtime from VB.

ReportSmith is bundled with a runtime that when launched just sits there. Its function is only to print reports. To access it, programs need to be developed. A VB sample is included which lets users select a report. An application can communicate with the runtime through a DDE link. An example of doing this in the documentation.

## Light on docs

Paper documentation varies widely from one package to the other. For R&R, we had two very light manuals and a more detailed *Using R&R*. These are the manuals that accompany the SQL Edition Version 2. More

printed manuals will accompany version 6. According to R&R *Getting Started* gives the basics and *Developing Applications* is focused on the run-time. WinQL comes with only two manuals: a small one and a fat one! *Getting Started* takes the reader by the hand even explaining what a report is and advising how to write a model on paper before trying to design it with the software. The big one is made up of lessons and of a reference guide. By comparison the ReportSmith package is heavy, no less than five manuals accompany the disks. The *Installation Guide* describes the different database connections, then two manuals are written as tutorials. The *User's Guide* is a complete reference manual and the last manual details the macro language. ReportSmith's manuals show, in addition to the standard screen captures, the toolbar's icons. It's clearer than the description stage the two other products' manuals have to go through.

Online help is very complete for all the report generators with more than 2 MB for WinQL. Online help for WinQL is organised in three main sections 'How to use WinQL', 'Reference' and 'Developer's information'. In addition there's a glossary, a very quick start guide and 'Support Q&A'. This last option reveals numerous tips which can prove very helpful.

The R&R one includes also three main sections titled: 'Using R&R', 'Reference Information' and 'Technical Support'. In the beta I used the reference section was empty and technical support just lists how to get some support. 'Using R&R' is divided in 18 chapters. ReportSmith divides its online help into two main sections: 'Reference information' and 'How to', but that's just the top level of a very big hierarchy of sub-sections, topics, sub-topics...

## Simple doesn't mean limited

Out of the three I definitely preferred ReportSmith mainly because of its modeless interface. It breaks with this traditional dichotomy between editing mode and result viewing mode. I found it the easiest to use. But that doesn't mean that R&R and WinQL are not good at their job. I was able to develop the same type of reports with all three of them.

*ReportSmith 2.0 for SQL is available at £199.95 from Borland (01734 321150). R&R for Windows SQL version 6 will be on the shelf when you read this article. It is edited by R&R Software (01628 788181) and will cost £299.00. WinQL is available from Data Access (01923 242222) at £395. These products exist also in cheaper xBASE only versions.*



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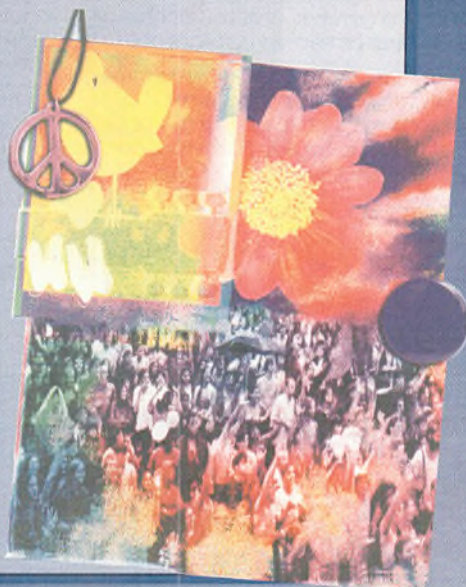
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## FREE Woodstock: 25th Anniversary CD-ROM

A special Christmas present to you, our beloved readers. We wish you peace, love and good tidings of great joy at this wonderful time of the year. And we say, chill out man. Stick this Woodstock CD in your machine and groove on down to The Who, Janis Joplin, Jefferson Airplane and tons of other greats. This fun packed little bundle also includes studio versions of songs, rare video interviews, photographs, film clips, cuts from the Academy Award winning film, a game, a 'groovy paint feature' and sing-along on-screen lyrics. Mind altering drugs not included. Now you can relive those sunny days when everyone tuned in, turned on and dropped out (except this time you won't be in an office/stuffy exam room/push chair).

Send us a picture of a flower (no, you don't have to draw it, in fact you can rip it out of a gardening products catalogue if you really have to). First postcard out of the bag wins. Wow man. That's cool.



# Ctrl

## CyberSniff

Just when you thought it couldn't get any stranger. Neural Computer Sciences has proudly proclaimed itself to be in partnership with the 'world's foremost electronic nose company' (AlphaMOS).

Don't get me wrong. Obviously the development of such a product is going to be beneficial. Especially if the use of neural networks enables AlphaMOS to imitate the wondrous capabilities of the human hooter. There are so many potential applications (and apparently a range of noses is planned). Ooh, this could be wonderful. The world will be transformed into a better place.

Or perchance not. In fact, I'd be willing to bet a month's supply of cream doughnuts (this is *not* a competition) that one of the first emerging high-street/shareware products involving the aforementioned technology will be of a more basic nature. Let us, for arguments sake, call it the Fart-o-meter.

I can see it now. It could sweep the nation as pranksters and japers alike installed versions on every PC/Macintosh they could find. Even more embarrassing than that weird dye they put in swimming pools. This scent-detector could provide hours of 'harmless' amusement for Jeremy Beadle lovers across the country. The days of the minor indiscretion are numbered.

You don't believe me? Neural Networks has the potential to create artificial intelligence with all the benefits that could bring. Yet the major commercial application of this technology at present is the Karaoke machine. The bottom line is, end-users don't want useful, they want amusing/noisy/irritating. And boy are they gonna get it. Let's just hope that NCS manages to come up with something slightly more innovative.

## CAPTION COMPETITION



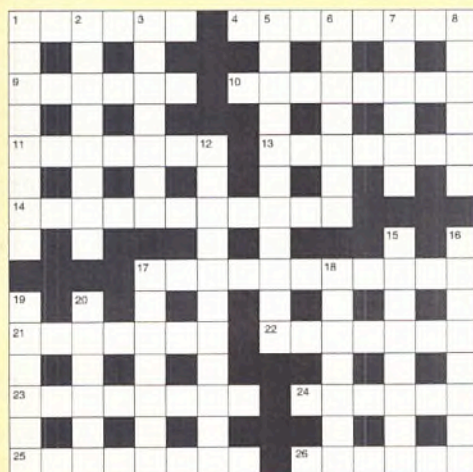
"Windows for motorbikes. New beta tester required."

Not suprisingly, pleas for prize-swaps have been flooding in ever since last month's caption competition winner David Ross decided to exchange his £10 music voucher for an EXE t-shirt. Requests for some kind of Multi-Coloured Swap Shop are being considered seriously by the Editor. Ctrl-Break, however, is worried as it remembers only too clearly the many infant profiteers who offered up their plastic R2D2 in exchange for a Hornby Railway Set: we fear the onset of generic DOS owners attempting to acquire Windows 3.1.11... or is that the other way round?

October's picture was of course Jules May's poor old motorbike: slightly the worse for wear after he drove it into a brick wall. E. Bates (gender unknown) of Goldsmiths Group, Leicester came up with the caption and is now the proud owner of the obligatory EXE T-shirt, mug and pen.

Winner of last month's jolly competition to identify the river pictured, after pretty obvious clues from us, was Dr Warren L Kovak of Anglesey. The answer was, of course, the River EXE.

## PRIZE CROSSWORD



### ACROSS

1. Far away with a data item space (6)
4. Trivalent impurity may take something or... (8)
9. ...use structured works, musically (6)
10. Grinding gin hangs crookedly (8)
11. Chats round the Spanish holdall (7)
13. Carry out a repetitive approach (7)
14. The stuff of our technology (11)
17. More than a cosmetic improvement, one hopes (11)
21. Rupert follows program error - what a nuisance (7)
22. Work of a linker in organisation (7)
23. Find the significance of an expression (8)
24. Chips' raw material (6)
25. Young Edward goes round there like a goat (8)
26. Shook hands on silver grass (6)

### DOWN

1. Coupler for the hotel room? (8)
2. Work out what's what, on parade? (8)
3. Tanned matter (7)
5. Branching statement (11)
6. Oriental sorce of much hardware... (7)
7. ... here, for instance, where I want a change (6)
8. Dubious values at the rear (6)
12. Plastic copy of 3 may heat letter one way or another (11)
15. Shed fluid with hard work (8)
16. Norm to look up to (8)
17. Carry out - capital? (7)
18. Oriental grains cooked when wiping the files (7)
19. Complain about final code (6)
20. Horrified when Silver has the start (6)

16. Norm to look up to (8)
17. Carry out - capital? (7)
18. Oriental grains cooked when wiping the files (7)
19. Complain about final code (6)
20. Horrified when Silver has the start (6)

### Answers to November's crossword:

**ACROSS:** 1. Signals 5. Reading 9. Organ 10. Attenuate  
11. Ambient 13. Array 14. Extension 17. Acorn 19. Basic  
20. Redesigns 23. Subunit 25. Chained 27. Claimable  
28. Basil 29. Spindle 30. Resists.  
**DOWN:** 1. Storage 2. Gigabyte 3. Annie 4. Scart  
5. Retrained 6. Abnormals 7. Italy 8. Gremlin 12. Nos  
15. Nickname 16. Irritable 18. Organisms 19. Bisects  
21. Eth 22. Saddles 24. Bhagi 25. Clear 26. Abbes.

This month's crossword prize is the Oxford Compendium on CD-ROM, kindly donated by Oxford University Press. Please send your entries to the address on the next page. October's winner was Mr Ray Crowther who wins the Monty Python CD-ROM (see 'Complete Waste of Time' story on the next page.)



# Break

## A COMPLETE WASTE OF TIME

Will those Python lads ever give up? The twenty fifth anniversary of Monty Python's Flying Circus sees the arrival of 'the world's first interactive comedy show'. Monty Python's 'Complete Waste of Time' includes classic sketches such as Dead Parrot and Nudge Nudge with new comedy and ani-

mation made for the project. There's even a game: 'The Secret of Intergalactic Success' (they should know).

Best of all though, is the Desktop Pythonizer, which, they claim is 'designed to give your computer a personality: then at least one of you will have one'. Charming. Now you can really annoy Jim from Accounts when he comes back to find his Program Manager icon replaced by a can of Spam, with the wallpaper scene of your choice (flying pigs defecating on cowboys is one possibility).

And so it was that in the bleak month of November, Ctrl Break was lured out of its cosy office by the chance to talk to Mr Bob Ezrin. He's one of the top dogs at 7th Level, the company which produced the Python CD, and kindly flew all the way over from the States to show us journalistic types just how much better he was at the game than us.

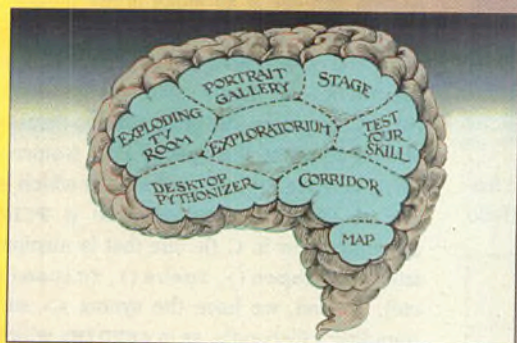
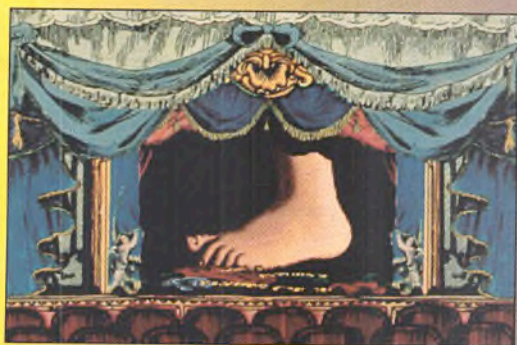
It would be difficult not to like the Python CD, but Ezrin really did seem quite charmingly fond of his new product (and the money of course). But as the man who produced Pink Floyd for 18 years, he should know a groovy thing when he sees it.

The authoring and playback engines for 7th Level's products were designed by a composite of Micrographics, Microsoft and Lotus developers. The speed and fluidity of this particular end-product certainly pay tribute to their investment which has been well received in America. (Why do they always get everything before us?).

7th Level believes that a computer is not 'a television that happens to have a keyboard'. A startlingly simple premise, but one that many CD-ROM manufacturers appear to be having difficulty coming to grips with. 7th Level has realised what software developers have known for a long time. People have relationships with their computers, or as Bob puts it 'they live with them, they eat with them, they breathe...they give them names, they customize them, they hate them, they feed them pizza...'

7th Level claims that in making its products it has brought together people from the worlds of content (read 'Hollywood') and software development. You, of course will have to judge for yourself. But if the medium really is the message, then I personally believe that the Monty Python team and 7th Level have got something new to say.

A Python CD forum has even been set up on Compuserve (just type GO SEVENTH). Get posting now to talk to Pythonites on a global scale.



## Brion and Betty

by Neil Kerber



## SUBSCRIBERS CLUB

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Turn to page 58 of the magazine and you'll find the first part of EXE's C++ Compiler Report. Obviously, however, we couldn't fit everything into the article. Which is why we're making available two detailed versions. The Technical Version costs £35. The Management Version (including full managerial reports) costs £75. EXE subscribers get a further 10% discount.

We firmly believe that UK developers are the best in the world, which is why we are launching the **EXE Software Developers Challenge**. This will take place at the Software Developer's Forum on the 8th and 9th of February. Don't miss this exciting opportunity to compete with the cream of Europe's development community. Dare you phone us now and accept the challenge? See page 6 in this issue for the full story. Fill in the card inserted in this issue for further details.

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**Computer Lib/Dream Machines** by Ted Nelson. Published by Microsoft Press. These books (printed in one volume) were self-published by Ted Nelson in 1974. In a fascinating mish-mash of pictures and pasted text Ted predicts the arrival of the home computer amongst other things.

**Accidental Empires** by Robert Cringley. Published by Penguin. This fascinating tale of the rise and rise of Silicon Valley and its inhabitants should give you all some power-seeking New Years Resolutions to think about.

Look out for the **EXE Book Club** Page which is to be launched in the January issue, offering a broad selection of technical titles at discounts to EXE subscribers.


Please send your rants, raves and competition entries to:

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December



# Welcome to Perl

UNIX seems to  
comprise almost   
entirely of glue. But certainly it  
does appear to offer lots of  
different ways of writing little  
programs. **Niall Mansfield**  
introduces one in the form of  
Perl.

All the well known scripting languages have problems. First, **awk** and **sed** are quite limited in what they do. They can manipulate text, but you don't have any real control-flow constructs in the language. For example, an **awk** program consists of a set of patterns plus chunks of instructions. If the next line of input matches the pattern, the instructions are executed; then the input is matched against the next pattern and so on. And **sed** doesn't let you call other programs from within its scripts.

Shell scripts overcome these problems but at a terrible cost. The shell has such a weird syntax that the scripts are dreadful to write and almost as bad to read. Since each line is a separate command, a script can involve running hundreds of processes with the attendant lack of performance.

## Not awkward

Perl combines the best of **awk**, **sed** and **shell** scripts. It offers the pattern matching and line-editing facilities of **sed**. It has the line-based matching of **awk** and the control-flow constructs and process-handling facilities of the shell. The syntax resembles C. There are normal arithmetic variables, operators and advanced special purpose operators for manipulating strings, arrays and lists. In addition it provides communications via TCP/IP sockets. Performance is relatively good because most operations are built-in rather than executed as separate processes. A symbolic debugger is also available for Perl.

## Basic I/O and variables

To begin with I will look at the language features, starting off with the ubiquitous 'Hello

World' program.

```
print "Hello, World\n";
```

It is run with the **perl** command as follows:

```
perl hello1
```

If our system has a sensible shell, we can make life simpler by including an extra line at the beginning of the file:

```
#!/usr/local/bin/perl  
print "Hello, World\n";
```

and changing the permission of the file **HELLO1** to include execute permission. Now we can run the program just by typing **hello1** on its own just as we would for shell scripts.

The **cat** program is another common test in UnixLand. Its function is to copy the input to the output.

```
#!/usr/local/bin/perl  
  
while ($myline = <STDIN>)  
{  
    print $myline;  
}
```

As you can see it all looks pretty familiar. For example the **while** compound statement, the curly braces and the semi-colon at the end of each simple statement are identical to C. However, the program also demonstrates some of the special Perl features. First, we have the keyword **STDIN** which is a Perl *filehandle*, analogous to a **FILE** stream pointer in C (ie one that is manipulated with **fopen()**, **fgets()**, **fclose()** etc). Second, we have the syntax **<>** surrounding a filehandle, as in **<STDIN>** which returns a text value that represents the next line read from the filehandle. The third syntax feature is **\$var**, where **var** is the name of a variable such as **\$myline** in this example. Unlike C, all Perl variables are addressed with an initial character specifying their type. The '\$' prefix means a scalar variable. Later we'll see other prefixes such as those for array variables or associative arrays.

Perl variables can contain text strings, numerics or other types of data. How they

```
#!/usr/local/bin/perl  
  
while ($myline = <STDIN>)  
{  
    $total_fax++ if $myline =~ m/ FAX: /;  
    $total_rpk++ if $myline =~ m/ RPK: | SPK: /;  
    $total_all++;  
}  
  
printf "Total FAX %d, RPK %d, overall %d\n",  
    $total_fax, $total_rpk, $total_all;
```

Figure 1 - A simple example of pattern matching



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```
while (<>)
{
    if (m/ (...):/)
    { $code = $1; }
    else
    { die "Weird product code
      found\n"; }
    $total{$code}++;
}
```

Figure 2 - Processing an associative array

are interpreted depends on the context. The following program adds up the numbers (or rather the first number on each line) in its input:

```
#!/usr/local/bin/perl

while ($myline = <STDIN>)
{
    $total += $myline;
}

print "Total is ",
      $total, "\n";
```

Note that we don't have to declare or initialise a variable before using it. The defaults are zero or the empty string as appropriate. In this example `$total` is taken to be zero when the first number is added to it.

## Pattern matching

Perl implements all the usual Unix regular expression pattern matching. For a simple first example, let's examine how we can extract a count of various product codes from a file, as shown in Figure 1. At User Interface Technologies all our product codes begin with a 3-character prefix, followed by a '.' and a sub-code. The code is always preceded by a space. So our example looks for each of the product codes and increments a count when a match is found. Again, there are a few syntax points worth looking at. First, to specify a pattern for matching, you use the `m` operator followed by the pattern

```
foreach $code (
    sort(keys(%total)) )
{ printf "%s: %d\n", $code,
  $total{$code}; }
```

Figure 3 - Sorting and printing product codes

within matching delimiters. (Slashes '/' are almost always used as delimiters, but you can use anything). So the code:

```
m/ FAX:/
```

says match the literal string consisting of a space, the three letters 'F', 'A', 'X', followed by a colon. The code:

```
m/ RPK:| SPK:/
```

is slightly more complex, as it matches either of the two strings separated by the '|' symbol, which indicates alternation (match any of these patterns). The second syntax point is that you use

```
$stringvar =~ m/pattern/
```

to specify which string variable you are performing the match on. Third, the conditional is expressed as

```
statement if condition;
```

## Syntax shortcuts

So far our programs look very like C, but with the big advantage that you don't have to compile them because Perl is an interpreter. However, Perl has extra features to make file handling easier, as it is such a common task. We can rewrite our CAT program as:

```
#!/usr/local/bin/perl

while (<STDIN>)
{
    print;
}
```

By default, input lines are assigned to the variable `$_`. If the `print` statement doesn't have any arguments, it prints the variable `$_`. So the `$myline` variable is not needed. Another special feature is that you can process multiple files specified on the command-line using the `@` notation without any explicit filehandle, as in:

```
#!/usr/local/bin/perl
```

```
while (<>)
{
    print;
}
```

Now we don't have to use the shell redirection `<` on the command line. Instead you can say

```
mycat file1 file2 ... fileN
```

just like using the real Unix `cat` program.

If we really want to process a file explicitly, as opposed to reading it as standard input, we can use the `open` and `close` functions. For example:

```
#!/usr/local/bin/perl
open(FHANDL, "abc");
while ($myline = <FHANDL>)
{ $total += length($myline); }
print $total;
```

opens the file 'abc' and counts the number of characters in it.

Another shortcut is to use `$_` as the default variable isn't limited to I/O. The `length()` function we have just used also operates by default on `$_`, so we could have written the heart of the above program as:

```
while (<FHANDL>)
{
    $total += length;
}
```

`$_` as default also applies to the matching of patterns. In other words, the two lines:

```
$_ =~ m/pattern/
m/pattern/
```

are equivalent. Further, if you use '/' as the delimiter in an `'m/pattern/'` statement. We can even omit the `'m'`, so the selection in our product counting can be done more succinctly (and probably less legibly) as:

```
while (<STDIN>)
{
    $total_fax++ if / FAX:/;
    $total_rpk++ if / RPK:| SPK:/;
    $total_all++;
}
```

## Substitution

Matching patterns is fine for selecting which input line to process, but we often need to change the text too. The substitution operator

```
s/pattern/replacement/
```

lets you do this all in one go. So if we wanted to list the products in a file, changing the product codes into their full descriptions we might use something like:

```
while ($myline = <STDIN>)
{
    $myline =~ s/ FAX:/ FaxPak:/;
    $myline =~ s/ RPK:| SPK:/ReadyPak:/;
    print $myline;
}
```



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As with 'm//', substitution operates on \$ \_ by default, so we could shorten this to:

```
while (<>)
{
s/ FAX:/ FaxPak:/;
s/ RPK:| SPK:/ReadyPak/;
print;
}
```

The above program merges product code 'RPK' and 'SPK', losing some information. So we could distinguish between the two, even in the same substitution command, by marking the matched text, with parentheses in the pattern looked for, and reusing it in the substitution string referencing it as '\1'. In English this would read: 'insert the first marked matched text.' And the code is:

```
s/ (RPK|SPK) :/ReadyPak \1/;
```

Note that we have moved the alternation inside the brackets; this means that the '\1' will substitute 'RPK' or 'SPK' depending on the input. Incidentally this is probably better programming practice because we no longer duplicate the punctuation surrounding the product code.

## Associative Arrays

A deficiency in our product counter is that if we add a new product, the program has to be modified to take account of it. In real life we would maintain a separate table of valid product codes and verify the input lines against this. But another way, which shows more interesting Perl code, is to use associative arrays. Associative arrays are also available in the new version of **awk**, sometimes called '**nawk**'.

An associative array is like a normal C array in that it has many cells containing different values. We access a particular cell by giving the subscript of that cell. But they differ from C arrays because the array index does not have to be a number. It can be an arbitrary string.

What we'll do for our product codes is build up an associative array for all the product codes as we find them. The 'key' (or subscript) into the array will be the product code. The value stored will be the count for this code. We process the input lines as shown in Figure 2.

We are using the **match** operator to pick out the product code. Since we have marked the pattern with parentheses, the matcher will remember the characters matched. So the matched string is stored in \$1. In the next line we assign this to the

```
$myary[1] = 5;
$myary[5] = "five";
$myary[7] = "boo";

for ($i = 0; $i <= $#myary;
$i++)
{ printf "myary[%d] =
%s\n", $i, $myary[$i]; }
```

Figure 4 - Processing a conventional array

\$code variable, then use that to index into the associative array \$total, and increment the count. The **die** function prints the specified message and exits.

It is more of a challenge printing out the values we have collected, as we don't know how many different codes there were or what the values were. The **foreach** loop overcomes this problem. Its general form is

```
foreach $variable (array)
{
statements;
}
```

This cycles through **array** assigning to \$variable the value of each element in turn then executing 'statements'.

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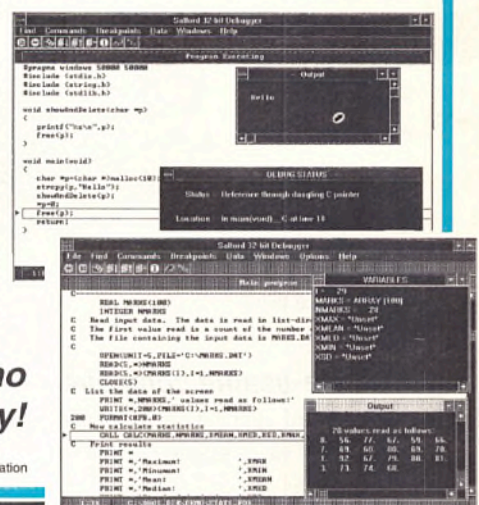
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As in C, the array `@ARGV` has special significance in that it holds the command line arguments issued to the program. Here is how we would print out each command line argument:

```
foreach $i ( @ARGV )
{
    printf "%s\n", $i;
}
```

Note that when referring to the whole of a (non-associative) array as here, the prefix character '@' is used before the array name.

We can use `foreach` to cycle through each product code in turn now, by using it in conjunction with the `keys` function to return an array of all the keys on which the array is indexed. The prefix character '%' is used before the arrayname to refer to the array as a whole rather than by individual element. Another function, `sort` can then be used to sort the keys into order before processing them. So now, the rest of our program can be written as shown in Figure 3. We can create and initialise associative arrays in the body of our code.

## Lists

Perl also supports conventional arrays subscripted numerically such as the array

`$ARGV`, containing the command-line arguments. Just as with scalar (ie non-array) variables, we don't have to size them, or even declare them before use. They are created and grow to the necessary size, as you use them. At any time we can find out the size of an array, or more precisely, its maximum subscript, from the special variable `$#arrayname`. Given an array called `$myary`, then its highest subscript is `$#myary`. Thus we can process the whole array with a loop as in Figure 4.

In Perl, arrays are also referred to as 'lists'. It doesn't really matter what you call them, but the reason for the terminology does give you a better understanding of what's happening. In some ways Perl is like the Lisp language. There are many functions which operate on lists of values and functions which returns lists as their return values. We have already seen a couple of these such as in the 'foreach' cycles through a list of values, and 'keys' returns a list. Like Lisp, Perl lets us construct lists explicitly in our code. Generally it doesn't matter whether the list of values is non-transient and stored in a variable (which is of course an array variable) or just a set of values returned from a function or constructed in the code. However, lists in variables are usually called arrays; other-

wise they're called lists.

A weird but very useful example of returning a list or array value is when reading from a file. As we've seen several times, a single line is assigned to a scalar variable with a line like:

```
$text = <STDIN>
```

However, if the left hand side is an array variable, then *the whole file* is read and the lines of the file are assigned to successive elements of the array. So after executing

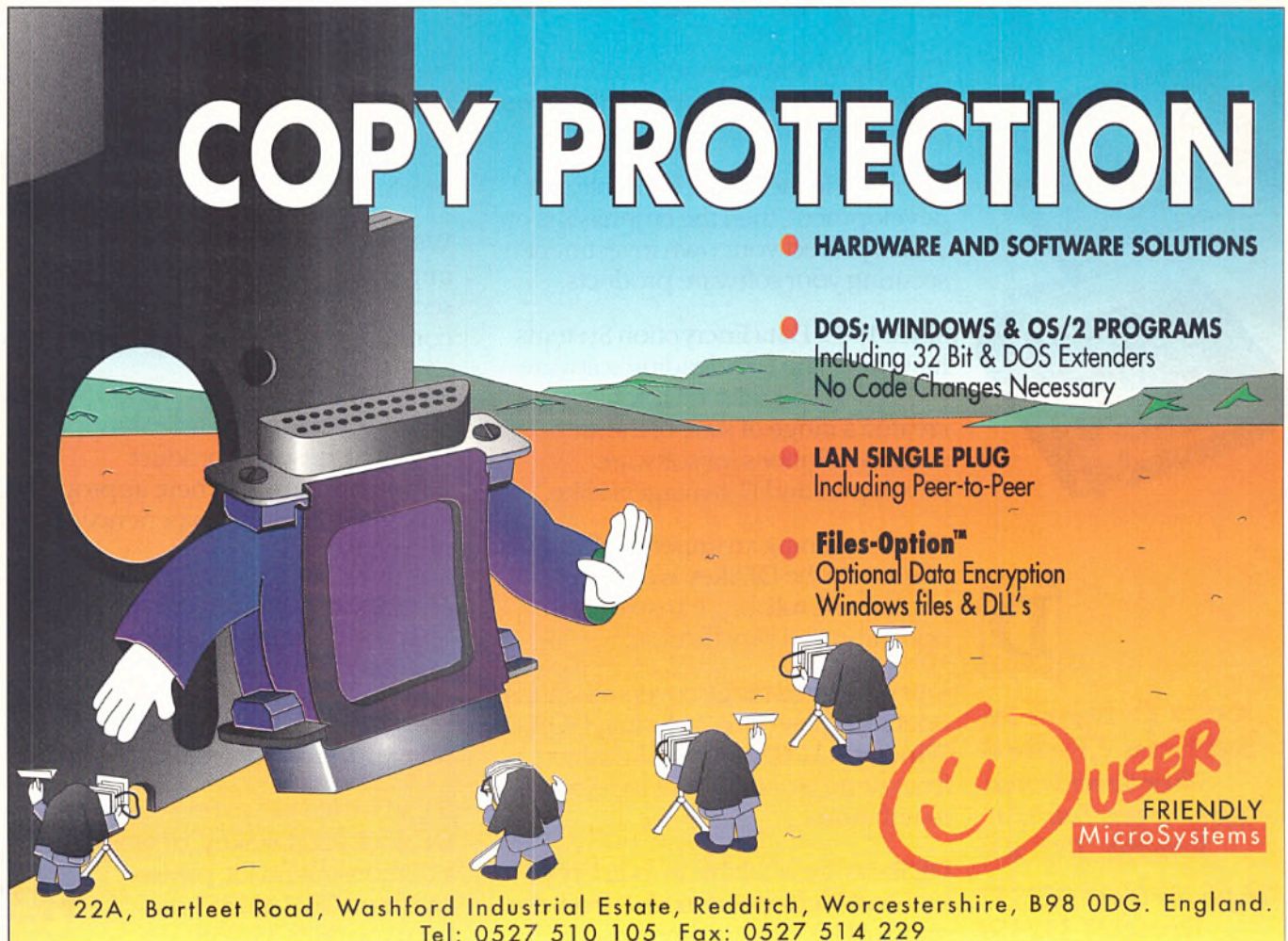
```
@myary = <STDIN>
```

(and note that '@' refers to the whole array) then `$myary[0]` contains the first line, `$myary[1]` the second and so on.

## Next month

Well it seems I have run out of space... Perl is obviously a very rich and powerful language. You will have to wait until the New Year for a complete, real world example of programming in Perl. Until then I hope you all have a merry Christmas.

*Niall Mansfield is the managing director of User Interface technologies. He can be contacted by phone on 0223 302041 or email as [nmm@uit.co.uk](mailto:nmm@uit.co.uk).*



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# Seek and ye shall find

The vast resources of the Internet are only going to be of use if you can find them when you want them comments **Paul Richardson** sagely. Stating the bleeding obvious? Well no actually...



Cyberspace. The final frontier. These are the voyages of the EXE Internet column. Our mission to seek out new discussion groups, information sources and lifeforms. To use all available search tools, detailing appropriate methods and situations. To report back to all readers. To boldly go where no EXE reader has gone before...

## The final straw

Picture the scene. You're back from a night on the town. Well of course you're desperate to find out the results of quite possibly the most important football game in the history of the sport ever. You turn on the news and disaster strikes. The producers haven't realised the earth shaking gravity of the match. The results are not there.

So what are you going to do now? You could try the Internet but the match only finished an hour ago. Unless there's someone sitting out there with one hand on the TV remote control and the other on the keyboard, the results just aren't going to be there.

Or are they? Why not try the Dutch teletext to web gateway? Turn to the appropriate

page for 'voetbal' results, and you'll find the score that you're looking for!

If you're prepared to look, the Internet really can give you the information you need on virtually any topic. But be warned, if you do happen to be looking for a resource that is not available, often the end result will be a cryptic message appearing on your screen. When this happens, try another service or try a little later. Some roads are better than others and some services are sometimes saturated by the number of requests. They've become too successful.

## The problem

Finding resources on the net is not always a simple task. There are many ways of searching the Internet and, to a certain extent, that is the problem. Which method should you use? Each search method has different coverage of resources and returns varying degrees of 'noise' (ie spurious information). Some methods look for specific resources, such as Web pages or software files and others return keyword matches over several resource types. This article will be organised by resource type, but will also mention those search engines that transcend resource boundaries.

Many services can be accessed individually but the most convenient way of accessing all these search engines (and more) is to make use of a Web page that collects all the URLs together. One particularly good example is the page on the Nexor site (see Figure 1) which classifies search engines by resource type and allows a choice of search technique through drop-down menus. The resource types listed on the Nexor page are explored in the rest of the article.

As searching the Internet is such a common activity one short cut could be to copy your favourite WWW search page to your hard disk, thus saving time, bandwidth and CPU cycles on several computers. Indeed it could make sense to configure your Web browser to use your local search page as the home page. To do this in Mosaic for Windows connect to the Nexor Web and save the page on your hard disk as CS-

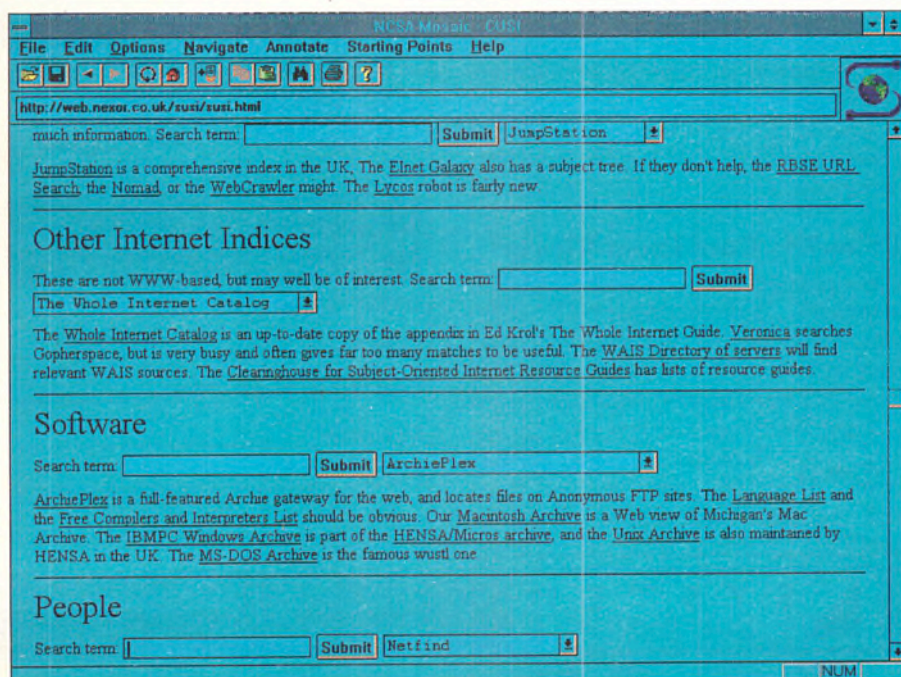


Figure 1 - The Nexor site search page on the Web



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#### Steve Berger, MA, PHD

Steve Berger is an independent computer consultant based in Bristol. Starting with a degree in Maths and Physics, and a PHD in Machine Intelligence, Steve has been involved in computer programming for the last 30 years and currently specialises in VO and Clipper.



#### Carol Paxton, MA

A graduate of Oxford University, Carol has been programming and supporting microcomputers for most of the last ten years. An accomplished database programmer, Carol has written applications for a wide range of companies, from merchant banks to plant and machinery contractors, using Clipper, Oracle, and Paradox.

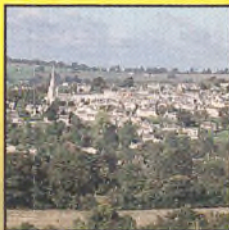


#### Steve Hallam

Steve has been developing microcomputer applications since 1980. He has written systems for Texaco, Rolls-Royce, Racal and many other customers, mainly using dBase, Clipper and Visual Basic. Apart from his training and development work, he also writes for the Visual Basic User Group magazine.



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Usenet FAQs	Needs a WAIS client or a proxy server
Any title in the Library of Congress Catalogue	A huge database of publications

Figure 3 - Document search types

*SRCH.HTM*. Then modify the *Home Page* entry in *MOSAIC.INI* to point to the page on the local disk, eg:

```
Home Page=file:
///C:/MOSAIC/CS-SRCH.HTM
```

Note the absence of a site name and the substitution of the pipe symbol ('|') for the colon.

### Walking the web

WWW indices are, in the main, manual or semi-automated indices of the titles or bodies of Web pages. They return a higher signal-to-noise ratio than the automatically generated indices described below and so should make a good first port of call.

The *Robot Generated WWW Indices* can return copious quantities of matches. They are particularly useful for exploratory searches, or if a search using the non-automated indices proves unsuccessful. In this context a *Robot* is a utility that walks the Web, searching and/or indexing it's findings. There is a very interesting page on the Nexor server which lists many Robots and gives some background information on their operation (see Figure 2).

These are generally subject-orientated guides that direct the browser to the most important sites for each subject. The exception is the *Veronica* entry.

Prior to the popularity of the World Wide Web *Veronica* was the mainstay of Internet searching for a number of years. It still has its uses in tracking down references to keywords in material that falls outside the bounds of the Web. *Veronica* searches Gopherspace, which is to say the titles of all the documents that are available via the Gopher protocol. But be warned, Gopherspace

still accounts for a sizeable proportion of the Internet's resources so *Veronica* will usually be very garrulous on the specified search subject.

### My ol' mate Archie

If you're intent on looking for software, you may remember that way back in my first article (June '94) I introduced you to 'Archie', a service which collates and indexes all the files stored on a large number of FTP sites, and allows searching on this index. Nexor has implemented an HTML forms-based interface to Archie called Archieplex so that you'll never have to leave the comfort of your Web browser again.

You will see several other entries listed under 'Software', such as the 'Free Compilers List' and several platform-specific, searchable archives. Bear in mind that Archie has some limitations. First the databases on different Archie sites are not always identical. Second they are usually updated only once a month.

### Where are you?

There is no more irritating feature of the Internet than knowing that someone who you want to contact has email access but not knowing their email address. If you wanted to contact them by phone you could use a local telephone directory or directory enquiries. But at present, there is no single reliable source of email addresses. There are, however, a series of techniques that can be employed in order to obtain an email address, several of which are made available on the Nexor page.

*Netfind* is an automated address-finding tool that works best when supplied with a name and organisation. It operates by looking up the organisation in a database that

maps to domain names. Then a Domain Name System query is performed to find the name server for these domains. Next an SMTP *VRFY* command is sent to each domain's nameserver, enquiring whether the specified user is known and which host his mail is sent to. Finally, *Netfind* issues a *finger* query to the mail host in order to obtain as much information on the user as possible. All the finger information is returned to the enquirer. Neat, hey?

Of course, if you already have a good idea which Internet host the user uses, you could issue a *finger* command manually, using the finger command-line utility, a GUI equivalent or a finger-to-Web gateway.

One reason to use other services concerns the availability of the *finger* command. Machines that are behind a firewall or that want to implement maximum security cannot be fingered. So the Nexor page also provides access to databases of Usenet authors' email addresses, X.500 entries and Internet domains.

Many organisations on the Internet (in particular, academic establishments) maintain a 'white pages' database of people working at the site. These databases are made available through what are known as, *CSO name servers*, which can be accessed by a Gopher client, or WWW browsers as they support the gopher protocol natively.

Triangle Online magazine has also launched The Grey Pages (Web pages are grey not yellow...). The URL is <http://www.trinet.com/tgp/>.

Searches for documents are also frequently necessary within the WWW. The searches are generally performed on one site that contains an authoritative set of the documents and hence these searches have a quick turnaround. The document types covered are shown in Figure 3.

### I have a Dream....

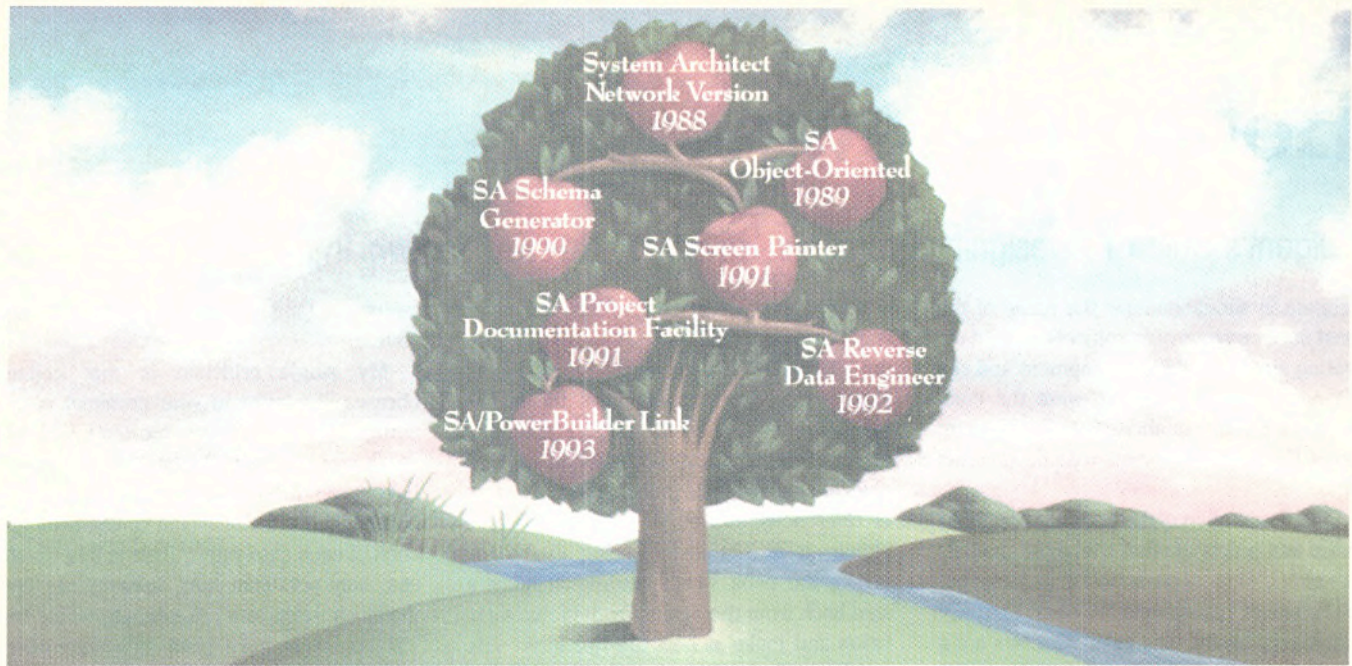
Now that the World Wide Web has been established as the primary mode of publishing material on the Internet, I believe that the next major technological improvements in the Internet's functionality will be in the area of resource location, probably in the form of universal white and yellow pages (Web pages, that is). Or even better having a software agent working for you the complexity of the Net. We wait with baited breath...

*Paul Richardson is a Director of Motiv Systems Ltd, a consultancy specialising in Open Systems, interoperability and the Internet. He can be contacted on 0223 576318 or by Email at PaulR@Motiv.demon.co.uk.*

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Mosaic communications search page	<a href="http://home.mcom.com/home/internet-search.html">http://home.mcom.com/home/internet-search.html</a>
Robot information	<a href="http://web.nexor.co.uk/mak/doc/robots/robots.html">http://web.nexor.co.uk/mak/doc/robots/robots.html</a>
Dutch teletext	<a href="http://www.iaelhv.nl/teletext/nos/index.en.html">http://www.iaelhv.nl/teletext/nos/index.en.html</a>

Figure 2 - Useful sites, robot information and the Dutch football





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- Application Development Trends Magazine June 1994



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# Book Review

## Taligent's Guide To Designing Programs - review by Edward Kenworthy

Taligent is simultaneously the name of the most famous vapourware object-oriented operating system still in development and the company developing it. So what the company has got to say about OO development using C++ must be worth reading, mustn't it?

The first section of the book is a combined index and precis of what's to come. Initially this struck me as a blatant bit of padding, but in retrospect, having read the book, I actually find it very useful. The initial chapters are a relatively gentle discussion of some basic OO ideas. Refreshingly, these aren't a simple rehash of what you read in almost any other OO design text and actually cover the sort of problems that a developer would come across designing and implementing their first proper, as opposed to the ubiquitous 'prototype', OO C++ development. Everyone knows about the more basic issues such as copy constructors and assignment operators. And these are covered. But it also examines the less obvious issues that probably won't occur to you until they turn up as a problem with your code (or problems with your design that appear in your code).

Later in the text the author discusses less obvious pitfalls such as problems with the design of classes and hierarchies of classes that don't appear until the implementation. One of these is the problems of object slicing that can occur when copying objects referred to by polymorphic pointers or references, as well as even less obvious pitfalls. It is this sort of thing that really makes the book worth reading. It takes a step back from the design or the implementation and looks at how the two interrelate and how a faulty design can lead to a buggy implementation. Hopefully this means that when you come across a problem in the implementation you'll at least consider whether it's actually the design at fault and not just tinker with the implementation.

Towards the end there is a short chapter that summarises the most important pitfalls, why they happen and how to avoid them. The final chapter looks at portability. Not that this has been left until the end as an afterthought (it's covered throughout the book) but rather examines those portability issues not already covered. A single appendix discusses issues associated with class

templates (and by inference function templates).

My single criticism is that cop-out phrases like 'refer to your architect before doing this' appear a little too often and isn't much use if you *are* the 'architect'. It would have been more useful, perhaps, if there had been more discussion of the pros and cons of each case rather than opting for the easy way out. That said, Taligent has kept the book down to a refreshingly waffle free 152 pages of pure gold (it's astonishing what you can fit into so few pages - other writers take note please!), so I can find it in my heart to forgive this little lapse.

**Verdict:** Highly recommended if there's any prospect at all that you'll be embarking on an OO development using C++.

Title:	<i>Taligent's Guide To Designing Programs</i>
Pages:	152
Price:	£14.95
Author:	Taligent
Publisher:	Addison-Wesley
ISBN:	0-201-40888-0

## Virtual Light by William Gibson - reviewed by Cliff Saran

A girl; a party; a man giving her grief. She really didn't want to steal them. Maybe she only wanted to teach him a lesson: let him lose something personal. The opportunity was right. He had his back to her. Delicately she extracted the sunglasses from his pocket and slipped out of the party as discretely as she had slipped in. It would have been far too easy had they been ordinary sunglasses. Unfortunately for Chevette they were not. Even in daylight they were pitch black.

Gibson, the father of the cyberpunk injects has injected a technological twist into these shades. Virtual Light is both the technology and the title of his latest novel. The technology refers to a method of stimulating optical nerves directly, without light.

VL specs were invented primarily as a way of making the blind 'see'. Being rather expensive they found a more commercial use as a means of interacting with a computer, an alternative interface. A landscape designer could look at a particular plant and instantly he could see the species name

alongside it. VL specs could also store data. And in Gibson's world, people would kill for data, especially if it was the plans for the future of the city of San Francisco. Chevette had stolen the one pair of VL glasses that everyone wanted.

William Gibson's future is a harrowing one yet disturbingly familiar one. Prison inmates are used as human guinea pigs in HIV immunology experiments. It's reminiscent of reported atrocities in Nazi concentration camps. Private police forces or 'RentaCops' as Gibson calls them depict an escalation of the state of affairs in the US today. Personal protection for you, your home and your family is only a phone call away... And of course there are data files on everyone. How else could they have tracked down Chevette. Certainly she went into the building. But there was no record of her leaving.

So she has to get rid of the glasses. But she is on the other side of town. Meanwhile Rydell, a freelancer for the security firm IntenSecure, having previously been fired

from there, and two bent Russian cops are separately waiting for her. And then there is the character who Gibson calls Loveless. In the chaos that follows Chevette ends up with Rydell, on the run from the Russians, Loveless and IntenSecure.

It is a complex story told in a style that portrays the frantic nature of the environment in which the characters live and work. While set in the future, a decade or so from now, there certainly exists a sense of worrying familiarity throughout. The genius of the novel lies in the way in which the familiarity pulls the readers further and further into this future reality.

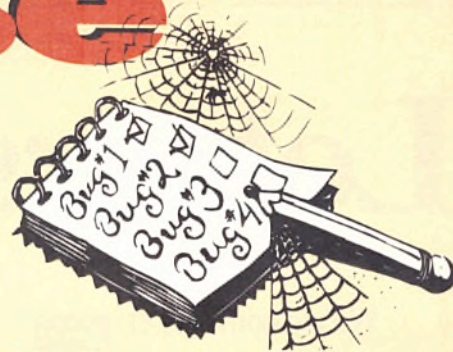
**Verdict:** Confusing but highly addictive

Title:	<i>Virtual Light</i>
Pages:	296
Price:	£5.99
Author:	William Gibson
Publisher:	Penguin
ISBN:	0-14-015772-7



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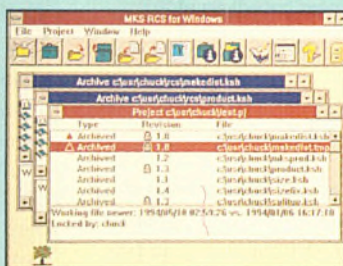
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# Letters

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 [cliffs@dotexe.demon.co.uk](mailto:cliffs@dotexe.demon.co.uk).

Unless your letter is marked 'Not for publication', it will be considered for inclusion.

## The cost of security

Dear EXE

Another excellent review from Mary Hope (November '94, page 32-40). However, as someone with an amount of past experience in the marketing and sales of ODBMSs, maybe I can shed some light on why Poet seems to be such good value in comparison to the 'bigger' names such as Versant, Objectstore or Objectivity (prices vary, but generally oscillate around the £7,000-£10,000 per developer mark). And before I go on, let me say that I no longer have a vested commercial interest in any ODBMS, so whilst what follows may certainly be flawed, it is at least an honest perspective.

I know EXE likes short letters, so it's going to be difficult to present a balanced view, but here it goes. I *do* accept that what Mary experienced of Poet whilst preparing her review certainly seems like very good value. But let's recapitulate on some of the reasons why people buy *commercial* databases, rather than simply stuff the data into a flat file (aka persistent streams in C++).

A database needs to support multiple users. It must guarantee 100% error recovery during a system crash. It should support distributed applications. It should not only be ported to multiple platforms, but should enable multiple hardware platforms to coexist within the same physical online database. Readers will easily identify more desirable (perhaps vital?) characteristics to suit their own circumstances. Features like

these are very, very expensive to implement and help explain some of the cost differences between the various persistent-storage OO product offerings. And it's precisely features like those above that were not considered in the review - no doubt because they are difficult to assess on a standalone PC running Windows.

Yes, Poet and its ilk are great for implementing persistence in C++. I might even buy a copy myself. But let's compare apples with apples. A pleasing persistent C++ API is probably the least significant criterion when deciding upon which ODBMS to invest in for true database applications.

Clive Harris

*Object Productivity*

## We are no sheep

Dear EXE

In response to the last paragraph in Alan Hambrook's *Soapbox* (EXE October, 1994), the company for which I work has a huge investment in the old system, namely 12,000,000 lines of Cobol code. There is a substantial investment in hardware, but that turns over at a much faster rate. The most precious investment is the 100 or so Cobol developers. We know that 'letting go' is wasteful and risky because we did that last time, moving from batch to online processing in a 10 year project which finished about four years ago. This time, more extensive processing, more business-critical systems and more pressure on expenses have increased the potential waste and risk to such an extent that 'letting go' is not viable.

So we cannot follow the herd down the rewrite rout (no 'e' here!). Instead we would like to lead the pack by enhancing the investment we have in Cobol and tracking its language revisions. Our fastest route into client-server and object-orientation is being ready to move with Cobol when these features come in with the 1997 language standard. May I ask what strategy Mr Hambrook will suggest for the next paradigm shift?

Peter T Dixon

*High Wycombe*

## Misbehaving doubles

Dear EXE

I was wondering if any of your readers can help me. I am a user of Microsoft QuickC (ver 5.1, rev 1.01) programming in the

QuickC IDE. I cannot get any maths functions to operate correctly. Attempting to run (from within the IDE) any program using a maths function returns 'error C2175, \*\*\*\* : unresolved external'. A typical program I am trying is:

```
#include <math.h>
main()
{
    double x , y ;
    x=2.54;
    y=sqrt (x);
}
```

As you can see, the program accepts the preprocessor directive to include the MATH.H header. I tried several installations using different combinations of memory models (small, medium, compact and large). The installation scripts advise using the medium memory model and EM co-processor emulation, which I have duly followed. This had no effect. Also moving MATH.H from \INCLUDE to \BIN and changing from #include math.h7 to #include math.h with no change. I talked to Microsoft development support who advised replacing the **extern double HUGE;** line in MATH.H with

```
extern double cdecl HUGE;
```

I tried this but the problem remained the same. I feel it must lie within the MATH.H header file and possibly other library files. Without the use of the math functions, the system is obviously useless for my area of programming. If you could pinpoint the problem I should be very grateful. Could it be an actual bug. If so, where can I get a fix as it is no longer a supported product by Microsoft? I know this is amazingly simple, but I can't fathom it.

Andy Flew

*Dorset*

## 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.





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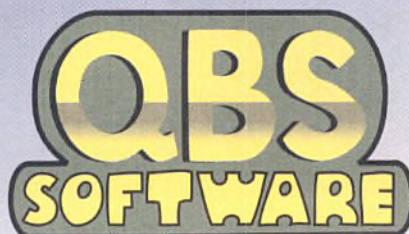
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# Employment in IT

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The most common way to apply for a job is, of course, the CV. The first point to make in regard to CVs is that qualifications count. Understandably, companies want to see proof that you have the ability to justify your salary. A degree implies dedication, the ability to research and pursue a goal.

On the other hand, graduates fresh from university can often find themselves caught up in the employment vicious circle: no experience = no job, no job = no experience. Many ex-graduates initialise their careers in less than prestigious positions knowing that once experience is gained they become the most valued.

Formatting your CV for the best results depends on you. Those with experience will place career details before qualifications and *vice versa*.

Use bullet points to highlight key interests. And keep it short and sweet: 'Research and Development' sounds more concise than 'Finding new ways to...'

If you don't program with objects then start now. Programming Windows, C++ and a *methodology*, say, Rumbaugh, is a must. There are an abundance of GUI/object-related positions out there which are unfilled.

Certain words may adversely influence the reader. It is important to avoid: 'troubleshooting' and especially 'debugging' as this could imply that your code has bugs in it (although whose doesn't?). If you feel the need to give your marital status, stick to either 'married' or 'single'. Sad to say, but variations on this (divorced or separated) can actually imply failure in some people minds.

It is arguable as to whether your hobbies and interests will actually sway a decision. Bill Gates was recently quoted as saying that Microsoft is 'not interested in well rounded per-

sonalities'. They want propellor heads, which is fair enough. But do bear in mind that other companies have been known to 'sift out' on the basis of lifestyle. The bottom line is that you shouldn't lie. It really is best to let them see the real you.

Economy with the truth is an important issue within CV drafting. Whilst you should never lie in your CV (this could not only be embarrassing, it could also be fatal to your career), you should also never disclose anything which could label you as a quitter. If you didn't finish a BTEC course when you first left school, but have since gained many suitable qualifications, do not tell them about the unfinished BTEC. Accentuate the positive, eliminate the negative and don't mess with Mr In-Between...

Your current salary, for example, is your business only. Agencies may ask (this information can be relevant in finding the right job). But make it clear you do not want this information divulged to their clients.

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£17-35,000

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### Oracle/Sybase

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REF: SC/01/EXE

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£20-£25K + Banking benefits

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£17-£25K + Banking benefits

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### 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/OOD AND OOP

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

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

Software House and End Users in Finance, Banking, Manufacturing, Commercial, Scientific and Government application environments require excellent C skills. Both Windows development skills W3, 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

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### UNIX/VMS/MS WINDOWS/NT MFC

A degree in computer or natural science, two years solid 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

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 XUT 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

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VISUAL BASIC SKILLS MUCH IN DEMAND - PLEASE CALL TO DISCUSS

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LONDON COMMS SPEC X25, X400 £40-60K

REF: SC/12/EXE

## the soft corporation

3rd Floor, 7-15 Rosebery Ave, London EC1R 4RP  
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## PRODUCT DEVELOPERS

Our client, a successful authorised European republisher of the world renowned and award winning product **Maximizer**, has an urgent requirement for two Developers with experience of full product development life cycles.

We envisage an initial six month contract working in a C++, MFC, ODBC, MULTIMEDIA, EMBEDDED MACRO, OLE AUTOMATION environment.

You will be working within a small specialised team developing advanced business applications therefore your background will include 2-3 years experience of C with at least 12 months C++ and Windows SDK.

## Maximizer

For more details contact Steve Hancock on  
**0296 393636**

Fax 0296 82621, or write, enclosing your CV, to  
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Established in January '92, Nomad is a provider of PROFESSIONAL contract personnel to both UK and Overseas clients. The majority of our work is concentrated in the following environments.

### ORACLE FINANCIALS

Business Analysts/Developers/Training/Consultants

### CLIENT SERVER/GUI SKILLS

Within the transport and travel industries, developing OS/2 based load and reservation applications (Permanent and Contract)

### SOFTWARE ENGINEERS

Unix Comms skills - C++, X25, TCP/IP, X.400/500

### Regardless of your expertise

Feel free to contact MIKE BARRON on  
081-686 7171, 081-680 1212

or

0732 886808 (24 hours)

**YOUR TIME WILL NOT BE WASTED**



## PC

## UNIX

### MICROFOCUS/COBOL

London To £18k

My client is a household name who is urgently seeking a Microfocus Cobol programmer who has gained at least 18 months experience programming on PC's. This is an ideal opportunity for an enthusiastic candidate who wants to work in a client/server environment.

### 'C'/PASCAL

Sussex £25k

Our client is an internationally based company who currently requires a Senior Analyst Programmer who has either 'C' or PASCAL programming skills gained in a client server environment. The ideal candidate will need to be both a creative and logical thinker. Excellent career opportunities.

### I.T. MANAGER

City To £30,000 + Bonus + Bens

Our client, a specialist banking institution, is looking for an experienced I.T. manager. Responsibilities include managing hardware, pre-implementation support, functional specification, supplier liaison and managing department staff. Experience of UNIX systems an advantage. Excellent career opportunity at a multinational city institution.

### CONSULTANT

Surrey £25,000 to £30,000 + Bens

Our client, a well established software house, is seeking an experienced UNIX professional to provide high level consultancy to their list of blue-chip clients. The role will consist of management level presentations, pre-sales, project sizing, and implementation. Knowledge of RDBMS and layered projects an advantage. Call Neil Chambers.

### C++/SDK

Berks To £25k

This client is an international software house who is offering excellent packages for C++/SDK Analyst Programmers. Exposure to Gupta or Zapp would be advantageous but not essential. Great opportunities for candidates who want to work with a Windows leading developer.

### VISUAL BASIC

City £High/Neg

This leading financial institution based in the square mile is in the market for experienced Visual Basic developers. Remuneration, Career opportunities and training are second to none coupled with the possibilities of international travel. Early opportunities for management roles are available.

### PROGRAMMERS x 3

Surrey £15,000 to £25,000+Bens

This well-known financial institution is seeking UNIX/'C' programmers to work on new and established financial systems. Various levels of seniority available for developers with over one year's solid 'C' coding experience. Structured career progression. Call Neil Chambers.

### FINANCIAL SYSTEMS

London £18,000 to £35,000+Bens

This major international I.T. firm has embarked on a financial systems project with the market leader in this field. You will need at least 1 year's development experience in one of: C/UNIX, C++, Visual C++, Visual Basic/Access or ORACLE v.7. Experience of financial markets, real-time, GUI's, or comms is useful. Call Neil Chambers.

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RECRUITMENT

# SYSTEMS DEVELOPERS

**£25,000 - £30,000 plus significant benefits • London Bank**

Our client is a leading securities and derivatives trading organisation. With a business spanning North America, Europe and the Far East, the bank has enjoyed rapid expansion and high profitability.

The global business solutions are delivered from London and the emphasis is on building high quality, long term systems. Typical project teams are small and focused which necessitates each developer to contribute at every stage of the project lifecycle from requirements analysis through programming, testing and implementation.

A set of new developments has created the need to recruit a number of experienced developers with the following profiles:

- 2-5 years' development experience
- Graduates (Numerate / Computing subjects preferred)
- 'C' programming skills
- Relational Database experience
- Appreciation of the use of structural methodologies

As previous financial experience is not required, this is clearly an opportunity for developers who have trained with a high quality first employer e.g. a leading software house or consultancy, to focus their skills in the investment banking sector.

This is predominantly an Ingres development environment at present, although an increasing number of projects use Sybase, C++ and Visual Basic. The culture of the organisation actively encourages developers to broaden their experience across projects and to work closely with the users in the business.

If you wish to apply for one of these positions, please forward a curriculum vitae to John Moody, Catalyst Consulting, Parade House, 135 The Parade, Watford WD1 1NA quoting reference IGI. If you require further information, please call John Moody on (0923) 240139 (office hours) or (0956) 339620 (evenings/weekends)

Interviews will be held in London.



**CATALYST CONSULTING**





# INFORMATION SUPERHIGHWAY

## SOFTWARE & HARDWARE DEVELOPMENT ENGINEERS

SOUTH BUCKS

to £35,000



Madge Networks is a multi-national company providing high speed computer networking products to customers throughout the world.

The acknowledged leader in Token Ring and FDDI networking, they have sustained unprecedented growth since their foundation as a UK company in 1987, with sales in excess of \$140m last year.

Madge is now developing ATM products for the next generation of high speed LAN and WAN networks, and have new vacancies in their Research and Development centre.

Candidates must be exceptional software or digital hardware designers. You should have a 1st or 2.1 in a numerate discipline from a good university and be able to demonstrate ability and enthusiasm.

Your background must include some of the following:

C, Assembler, 80X86 PC family, Sun, DOS, OS/2, Windows device drivers, Windows SDK, UNIX kernel and device drivers, LANs, network protocols, ATM, real time software, ASICs, FPGAs, VHDL, High speed digital design.

The ruraly situated working environment is informal with emphasis on technical excellence and innovation.

If you want to work with the best in the industry and can contribute to future growth and success, then call Gary Raymond of SCR, quoting reference number: E/172, on 071 405 4180 or send your CV to him at the address below.

All agencies apply to SCR.



The Recruitment Specialists

5 Bream's Buildings, Chancery Lane, London EC4A 1DY Tel: 071 405 4180 Fax: 071 430 1140

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Tel: 021 200 2660  
Fax: 021 236 9357

MANCHESTER  
Tel: 061 834 0618  
Fax: 061 832 9123

A MEMBER OF THE PSD GROUP

### Unix/Sun Systems Administrator

**City** **£27,000 + Bank bns**  
Major North American Banking group require a Unix/Sun Systems Administrator. You should have at least 3 years experience in a systems administration role. The ideal candidate will be familiar with Unix implementation in a Novell environment and be trained to Unix advanced systems administrator.  
**Contact:** Mark Bamber **Quoting Ref:** MB4800

### C, DOS, Real Time

**London** **to £23,000**  
This developer of real time communications software for the sports industry is seeking well qualified Development Engineers. You need to have achieved a 2nd class degree minimum and have indepth MS DOS and C experience coupled with exposure to Yourdon methodology. You will be developing software which will produce up to the minute information and images worldwide.  
**Contact:** Adrian Wagstaff **Quoting Ref:** AW4801

### Low Level DOS

**Midlands/S. West** **to £26,000**  
Twelve months post graduate C and DOS development experience will open the door to two of the best projects currently available in the UK. You will be developing leading edge software used worldwide. Needed are a good degree qualification, MSDOS (pref internals) and C experience, with a desire to move into Windows SDK, Device driver development Netware and Windows NT. If you are looking the 'THE' opportunity then look no further  
**Contact:** Adrian Wagstaff **Quoting Ref:** AW4802

### Video Special Effects

**London** **to £30,000**  
Real time video in WINDOWS, 30GByte real-time systems, object oriented design and development, sophisticated GUI front ends. Sounds amazing doesn't it? Well it is! If you are a young, bright software engineer, have C or C++ experience from an audio or video background and equally importantly, have a real enthusiasm for video/audio systems or techniques this is the company for you. A highly creative atmosphere within a thriving ground-breaking company for right minded people.  
**Contact:** Mike Jenkins **Quoting Ref:** MJ4806

### Embedded SQL

**Middx** **to £25,000**  
This company's product makes extensive use of Gupta SQL Base, as an application where speed is particularly important they use C and API rather than SQL Windows. They are very keen to recruit an experienced embedded SQL developer with at least 1 years post graduate experience. Although experience of Gupta's API would be ideal, cross training will be available. In return they offer a challenging yet pleasant working environment including an advanced training and career development programme.  
**Contact:** Simon Drew **Quoting Ref:** SD4805

### Senior Analyst Programmer

**City** **£30,000 + Bank bns**  
Prestigious North American International bank have an urgent requirement for a Senior Analyst/Programmer with 3-4 years experience in C/C++, Unix and Sybase. Exposure to Visual Basic would prove useful, as would experience in the financial sector covering derivatives, fixed income and equity products. The position will involve providing development, maintenance to various departments in the London Office.  
**Contact:** Mark Bamber **Quoting Ref:** MB4804

### GUI Team Leader

**City** **£26-£32,000**  
As the leader in the field of information assimilation and dissemination this company can offer unrivalled opportunities for career development and technical challenge. They are recruiting for an experienced GUI developer with 3 years or more experience of C/C++ and SDK. In addition to your strong technical abilities you should have some experience of leading a small team of developers. Experience of porting to Unix would be useful as would experience of MAPI, VIM or other E-Mail technologies. In addition to an excellent salary they offer a superior range of benefits.  
**Contact:** Simon Drew **Quoting Ref:** SD4803



For more information please call the relevant Consultant on 0442 231691 days or 0908 222909 eves/wkends quoting the relevant ref no. Alternatively send your cv to:  
**Executive Recruitment Services**  
Boundary Way, Hemel Hempstead Herts HP2 7RX or fax cv to 0442 230063.



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**All acquaintances be forgot...**

And so it came to pass, as the Winter months drew nigh. The curious people of England set their clocks back one hour farther than the rest of the world (in order to be exposed to as little daylight as possible and make working 9.00 to 5.00 just that little bit more depressing). And the great holiday commenced celebration. And there was much merriment and jollity.

For such was the importance of the great holiday that it required full two months preparation. It was Xmas Day.

Yea and the Office Party, the logical conclusion of Xmas Day, was in great profusion. And at each office party there was much mistletoe and holly, these being the symbols of Xmas Day. For everyone knows that their leaves are the same joyous hue as the face of the devout Xmas Day celebrator. And there were sponsored vomiting contests. Group ribald songs. Minor indiscretions. And each

year to Sarah, the office receptionist, was assigned the task of drinking too much port and throwing prawn mayonnaise vol au vents at unwelcome visitors.

And twas rounded off by the Traditional Journey Home. A scene of much group camaraderie in which a coach (preferably a stolen one, full of Japanese tourists) wended its way through the suburban roads. With full cabaret effect provided by the lads from accounts giving their rendition of *Tie A Yellow Ribbon Round The Old Oak Tree*. Which did please the Japanese tourists and the coach driver greatly.

But in the hearts of the men of EXEnders was great dread. For Xmas was also the time of the Traditional Pantomime. At which time they were required to don the traditional hooped skirt, wig and pan stick of the Pantomime dames. Truly there is a high price to pay for International Fame As

A Software Development Soap Superstar.

Twas the age old tale of the lonely orphan programmer, downtrodden by her three Ugly Sisters. For they did force her to debug their code throughout the night, in the cellar, on a PDP-11. And lo and behold, there came the handsome Prince Taligent on his stallion, Pentium, to whisk her away from the toil and misery. 'What beautiful dialogs shall we make together my darling.' Oh, twas moving. And they all lived happily ever after. But not before they had sung merrily and danced to traditional pantomime song.

And lo, Xmas Day had at last passed. And yet *another* festival commenced. This time to welcome the arrival of the New Year. And there was much merriment and joy. And not least amongst these joys was the comforting thought that there was full 10 months until the gruelling build-up to the *next* Xmas Day. Bah Humbug. **M**

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# Are Memory Bugs Lurking in Your App?

There are many quality add-on debugging tools that catch a broad range of bugs, including invalid operating system parameters, resource leaks, and memory errors. However, because these tools detect such a broad variety of errors, their depth and vigilance in any single category of error is limited. SmartHeap is different. First, SmartHeap is exclusively dedicated to the category of bugs that are the hardest to track down: heap-related errors. Second, to deliver the utmost in memory error detection, SmartHeap implements the heap. Because it implements the heap, SmartHeap knows what heap data structures should look like. Consequently, SmartHeap is the only tool that knows exactly when and where heap corruption has occurred. **The result: SmartHeap detects variants of common memory bugs that all the other tools miss ... and goes on to pinpoint even the most obscure, elusive and insidious bugs.**

## Memory Access Errors Detected

Overwrites beyond end of allocated blocks	✓	?
Underwrites before beginning of allocated blocks	✓	?
Overwrites over internal heap data structures	✓	?
Wild overwrites via variable-size allocation guards	✓	?
References to data in uninitialized allocations	✓	?
Writes into freed allocations	✓	?
References to data in free allocations	✓	?
Double-frees	✓	?
References to free blocks by deferring frees	✓	?
References to non-shared data owned by another task	✓	?
Changes data in allocations marked "read only"	✓	?
Premature frees (allocations can be marked "no free")	✓	?
Resizing of allocations marked "no realloc"	✓	?

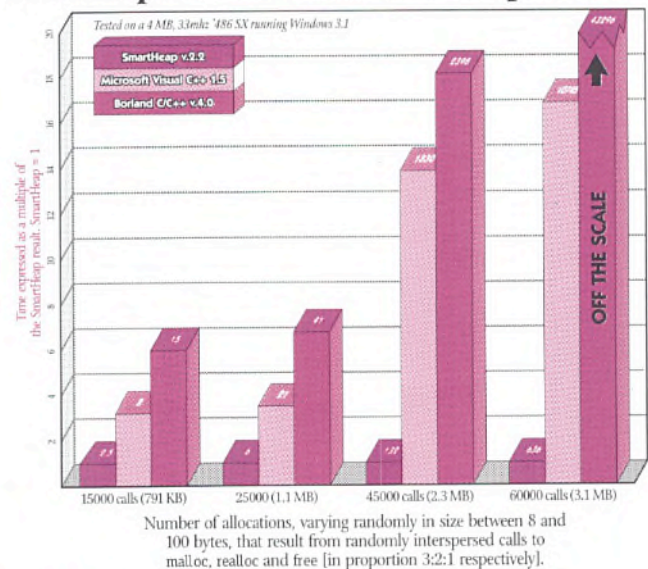
## Memory Leaks Detected

Allocations not freed at end of program	✓	?
Leakage at other points in program through API	✓	?
Leakage of designated group of allocations by checkpoint	✓	?

# SmartHeap Makes Your App Faster, Too

SmartHeap does not stop with exhaustive memory bug detection, it implements the runtime heap as well. In C and C++ applications running on virtual memory systems, malloc and operator new impact performance more than any other factor. **SmartHeap's proprietary algorithms deliver unparalleled malloc/new performance in Windows, NT, UNIX (Sun, HP, etc.), OS/2, DOS, and Macintosh. Benchmarks show SmartHeap is at least 3X and often 100X+ faster. Achieve even better results by using SmartHeap's malloc/new to automatically route small allocations below a parameterized threshold to an extremely fast fixed-size allocator. Or use multiple memory pools to improve locality and further eliminate fragmentation. And SmartHeap can be linked into your application in minutes – without source changes.**

## SmartHeap is 3–60X Faster Than Compiler mallocs



# Here's What Users Say About SmartHeap

"Here's another essential [tool] that is virtually unnoticeable once you've added it, but it saves you and your customers time. In debugging mode SmartHeap performs every form of error checking that I know of (and I did write the book on this). This is a giant time saver because it will find the kind of bugs that are very difficult to discover, and practically impossible to track down the cause of. Yet SmartHeap serves them up on a silver platter (actually in a MessageBox)."

Microsoft Systems Journal  
David Thielen  
March 1994

"Even when not in low memory conditions, we found that for test cases that involved large numbers of small objects, the performance of the application with SmartHeap was **much** better. We are pleased with the choice of SmartHeap and have adopted it as our default heap manager."

Ken Burgett  
Xerox Group Communications  
September 13, 1993

"This is my first testimonial in four years; rarely do I run across a tool that so completely solves a problem that I cannot imagine how we managed without it. Prior to going to beta, SmartHeap detected over a dozen unique memory bugs which were missed by [leading debugging tool]. Two of these were insidious memory overwrites which showed no symptoms on our development systems. After looking at them, I am certain that they would have blown up during Beta, would have been impossible to reproduce, and would have caused an extremely painful delay in our release."

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