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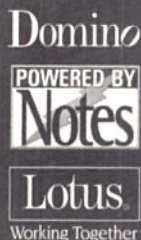
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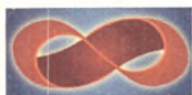


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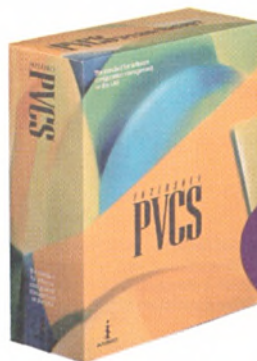
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# SoapFlakes

## Crossing the 't's and dotting the 'i's

In last month's SoapFlakes, I was talking about punctuation and promising that 'We will take extra care to ensure that the transcription is faultless'. Ok, that was about the handwritten code. When I wrote that, I knew I was asking for trouble: no doubt a typo would escape us but not you. What I wasn't expecting was what happened at our typesetter: the replacement of every extended character in all articles by a space (for those who missed October's *EXE*).

I feel that in addition to the apology I sent you, I owe you an explanation. The problem is that we still do not know what went wrong. Worrying, isn't it? We know very well where and when it happened: at the typesetter when outputting to films. But not how. We used exactly the same tools for the October issue as for the previous issues, sent the Quark XPress files the very same way (zipped on Syquest and by modem) as every other month. And to the best of my knowledge nothing has changed at the typesetter either. And yet this terrible catastrophe happened.

The typesetter has not been able to give us any explanation as to what exactly could have caused these rogue films to be output. The only clue they give us is that it never happened to them before, when outputting *EXE* or, for that matter, any other magazine.

As you might guess, I thought a lot about this problem and what might have caused it. I can think of five possibilities, most if not all of them quite improbable. First, as suggested in a letter, it's a virus! This is quite a common excuse for all sort of problems these days and although it's a possibility, it's very unlikely to have been the cause. Let's see what kind of virus could have created such havoc. A PC-based virus (at our offices) or a Mac-based virus (at the typesetter) replacing all extended character by spaces? Seems highly improbable. The PC virus possibility has to be eliminated right away since our

office proofs have all the extended characters. A Postscript virus? This is a more interesting possibility. Postscript is quite a powerful language and one could imagine a developer writing a Postscript virus that would activate itself in a printer. Dan O'Brien was mentioning this possibility at the *Access All Areas II* conference last summer. However, apart from the fact that I have never heard of such a virus having been written, it would have affected either our proofs or other magazines at the typesetter. So, we have to rule that one out.

A hardware problem at the typesetter? If the data is ever transmitted between two devices on a parallel link it could very well be that the wire carrying the 8th bit is cut or has a bad contact. But if this was what had happened either the fault would have been intermittent or other magazines would have been affected as well. Anyway the problem only affected one font, which just happened to be the one used throughout the magazine for the body of all the articles. I'm afraid that this explanation is not much better.

A human error at the typesetter? First of all they haven't admitted to any error on their part, and it would be unlikely that someone managed to configure their software to replace the extended characters of just one typeface in just one magazine.

I was almost about to forget the sabotage possibility! Who would want to sabotage *EXE*? I guess that this would qualify as a neat act of sabotage but somehow I don't believe that's what happened.

What are we left with? A software problem, the elusive bug. Not one of the persons involved in the whole chain of the magazine's production comprehends exactly what happened. How could it happen? Lousy programming in one of the pieces of software? One program's output being slightly different than what another program was expecting? A ghost from the past: one rarely invoked routine relying on 7-bit ASCII code? If my guess that a bug is the genuine cause of the problem (if you have any other

insights please email me) is correct, could it have been avoided?

In this unlucky chain of events why has the disastrous result been spotted only when it was too late to do anything about it? Two reasons: firstly because, for simple economical reasons, we do not have colour proofs made from the films, and secondly because no-one involved was expecting this bug. This might sound stupid at first but it is what happens most of the time in the software industry and among software users. We know that no software is perfect, after having used a program for some time we come to expect bugs, we *think* we know where they all are and we carefully check for them and avoid them. This is exactly what happened when checking if everything was right with the production of the magazine. When we received the films (printout on transparent plastic, one per colour, ie not that easy to read), we checked for the usual snafus: paragraphs badly cut, colour misaligned... but not for something that had never happened.

How can we plan for the unexpected? It has affected us badly and once again my apologies for it. But it has affected others too and sometimes in life-threatening situations, for instance when complete phone networks went down with the ensuing chaos (AT&T blamed a badly written *switch* statement; Telefónica, the phone company, which blacked out the whole of Spain's telecommunications network for five hours last month mentioned a 'software malfunction' according to the dailies).

The moral of this event brings a raft of more long term and provocative questions: should developers be considered accountable for what the software they've written does or doesn't do? What happens when more than one piece of software is involved (at more than one location)? Should there be software ethics? Could developers oppose (even damage) their company on the basis of ethics?...

David Mery





# Mayhem!

After the strange case of the disappearing punctuation last month, **Jules** has been wondering about why things go wrong.

The day that man made that first, prototypical machine – the wheel – the job of the engineer was born. The following day, another, even more pervasive profession joined it: that of the repairman. It just seems to be a fact of life; the more machines we make, and the better we become at making them, the more they go wrong.

Understanding why things go wrong is now a job in itself, and a jolly interesting job it is too. For machines whose failure is merely an irritation, rigorous failure analysis is little more than an amusing academic exercise, but where a failure would be catastrophic, such as in an aeroplane guidance system or a power station controller, failure analysis is a vital part of the engineering effort.

What analysts seem to concentrate on is the operation of the machine itself. How long, they ask, can a part be used before it wears out, and what will the consequences be when it does? What are the chances, they continue to ask, that one part of a program will exhibit a bug when combined with another specific part, and what are the consequences of that? More recently, their questions have begun to include the operator, asking how likely an operator is to misinterpret an instrument or press the wrong button, and how easily such errors can be corrected.

It may seem odd, but what all this analysis is directed towards is an accurate estimate of chance. A part cannot be guaranteed to wear out in a certain time; all we can say about it is that it is unlikely to wear out

before this time, that it's unlikely to be usable after another time, and that it's probably going to wear out somewhere between those limits.

One thing that worries failure analysts is problems that appear together, but have no known connection. Such groups of errors suggest that subsystems are operating together in some unrecognised way. Some time ago, a revolutionary study revealed

that failures in large systems do tend to group together, with long periods of trouble-free operation in between, and no more than the laws of pure chance are required to explain this behaviour. Yet again, the engineers have discovered something that everybody on the planet instinctively knows to be true: 'trouble always comes in threes'.

But, throughout all this analysis and intense mathematical and engineering





work, there's one thing that these analysts have failed to take into account, and that's the people who surround the machines, whether they're operators or not. There is something else that everybody on the planet knows to be true: some people are naturally lucky, and other people are naturally unlucky.

Consider the case of person A. Despite playing the lottery every week, she has never once got a single number right, let alone a winning combination. The chances against that are astronomical. And every time she buys a raffle ticket, the winning number is either one more or one less than hers. Buying even £1 worth of shares sends their price into a downward slide the very next day, which continues until she sells them, at which point the stock recovers almost immediately, probably making somebody else a small fortune. It happens every single time; if something is likely to go wrong one time in a million, it will happen to A one time in two.

Person B has a much brighter outlook. She can predict the cards in the little black bag in Cluedo before anyone has even made a move. I've personally watched her throw ten double sixes in a row, on demand. She's not cheating; nobody on earth can cheat those 'dice-omatic' machines you find in the middle of board games. No, for her, if something will go right one time in a million, she will succeed every time. Even though she's now only ten, everybody who knows her predicts she will grow up to play poker for a living.

You have to believe me when I say that I'm

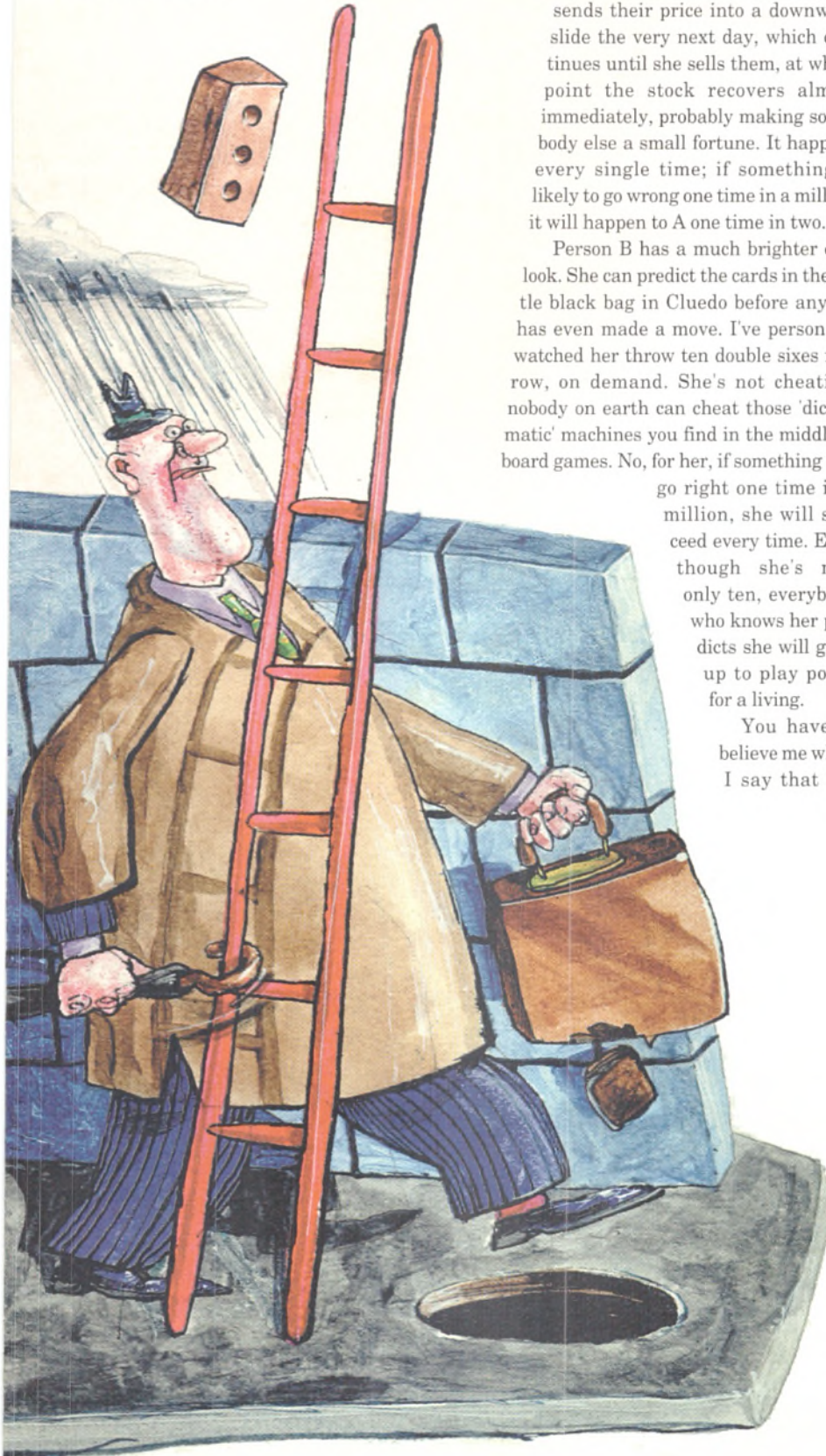
not just making this up. These two are real people who I know very well, and they influence chance around them in exactly the way I have described. But to return to the main subject of this article, since chance plays such a large part in the failure of machines and programs, you would expect such people to have an influence on the machines that surround them.

Sure enough, they do. Person A recently had a device installed on her telephone line to automatically dial Mercury when a long-distance number was keyed into one of her phones. After three weeks of trouble-free service in the house, A actually dialed a long-distance number. The first time, the call was routed to the Russian embassy. The second time, it called the phone upstairs. The third time, the device quietly exploded in resigned exasperation, and hasn't worked since. Person B's experiences are exactly the opposite. When the house computer had a disk crash, the only files which were recovered were hers.

I'm afraid I don't have any decent scientific language for this, but I'm now quite convinced that everybody carries around with them their own Chance Distortion Field. Perhaps it's because of the extreme non-linearity in computers, or perhaps it's because they go wrong more often than other machines, but it seems to me that computers are more sensitive to CDFs than any other machines. I'm not alone in thinking this; everybody knows someone who can crash any computer just by glaring at it, and everybody knows somebody else who couldn't make a computer go wrong no matter how hard they tried.

And this, I suggest, is the real reason why machines go wrong. It seems to me that anybody whose CDF is inimical to machinery will make a lousy engineer, because they'll break everything they touch. Good engineers are drawn from the ranks of people who machines can get on with, and whose distortion fields help the machine to operate. But when someone with a machine-destructive CDF buys a computer, or gets onto an aeroplane, or buys a house next to a power station, the designer's CDF is overpowered, and a far more hostile one takes its place. A perfectly healthy, fully failsafed, well-maintained machine with nothing at all wrong with it simply doesn't stand a chance. ■

*Jules is a programmer who is interested in faluroz uf alL kimdwsa: Hw\* dkapr c2 dowqmvciwadjem 19402-84565892\$2 ndl ajkn c a[4m, a,mdf] billg@usoft.com ncljq uwor s,*





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## Visual Café

Symantec's Visual Café v1.0, a Delphi-like visual RAD Java development tool should be available this month for Windows 95, NT and Mac. According to Paul White, Symantec's International Product Manager, Visual Café is suited for both expert developers and end-users alike. The plain Café product, on the other hand, is targeted at users who want to hack code and are not interested in a GUI environment.

Visual Café offers three modes of project editing: at the code level, via form design or by modifying properties. The latest product preview available at the time of writing was missing support for the Java layout manager and the option for developers to add their own components. This will be fixed in the release version, which will also include dbAnywhere (itself downloadable from Symantec's Web site). Absent from the shipping product, however, is support for the ActiveX and Java Beans technologies: these are due to be added in later releases.

Visual Café will be released in three stages: Visual Café 1.0 (£169, upgrade from Café for Windows: £49 and for Mac: £69) was announced for October, the Pro version (£200 to £250) for November and the Enterprise version (around £1000) for the first quarter of 1997. Subsequently, the release dates seem to have slipped by one month.

Visual Café Pro will add Web-based database access, wizards for connecting forms to databases and support for JDBC, ODBC, Intersolv, Oracle, Sybase, Informix etc. The Enterprise version will feature a database application server with support for business rules, application logic and repository administration.

Paul White quoted a survey conducted by PC Data which shows that Café has an impressive 75% of the Java market share. He added that among the happy users of the product is none other than Starfish's Philippe Kahn, founder and former CEO and President of Borland!

► Symantec: 01628 592222 ► <http://cafe.symantec.com>



## ActiveX to be dropped into Open Group's lap

Some time ago, Microsoft announced that it would be turning over the burgeoning ActiveX specification to an independent body, reducing its control to that of an ordinary voting member.

The actual transition, which was scheduled to take place almost immediately after the launch of Internet Explorer 3.0 – the first application to take advantage of the technology – was delayed while the company decided whether to hand the standard to an existing body or create a new one. Finally, they announced that control of the ActiveX standard would be passed to a subcommittee of the Open Group, to be known as the Active Group.

The ActiveX elements which will be handed over to the group are: COM and DCOM, the Microsoft RPC specification including IDL, NTLM Standard Security Provider Interface, OLE Structured Storage, and the Windows Registry, Monikers and Automation technologies.

The move was decided on 1st October in New York at a meeting of the informal 'ActiveX stakeholders' panel, consisting of Microsoft's strategic partners. Some have seen it as a surprising development, considering the Open Group's traditional pro-Unix slant – despite Microsoft's commitment to work with partners such as Bristol Technologies to port ActiveX to Unix, NT and Unix are competing products. Whether this signals a more conciliatory attitude to Unix within Microsoft, or simply means the company felt a separate body was not viable remains to be seen.

Putting ActiveX in the hands of a committee makes it difficult for Microsoft to unilaterally revise portions of the specification, but that disadvantage should be offset by the opportunity to leverage COM as a universal component model, which could ultimately spell trouble for rival standards such as CORBA and OpenDoc.

► Microsoft are on 01734 270001, ► URL <http://www.microsoft.com>

## Verity intensifies the search

Verity has announced its three-pronged Search'97 technology for deploying search applications with a single user interface across entire enterprises. The family of products consists of a consumer-targeted personal search engine, an information server, and an agent server for creating intelligent search agents. Version 2.0 of the developer's kit, which is available, allows developers to take advantage of Verity's searching technologies, including searching with typographic error compensation, and SGML attribute search parameters. Platforms supported include Windows 95 and NT, Macintosh and Solaris.

The developers kit and Search'97 Agent server are priced at \$2995 and \$10,000 respectively, with additional royalties due for the runtime environment. Philippe Courtot, Chairman, President and CEO of Verity, has said that he is conscious that Verity's product line is targeted more at large software houses than small shops. This should change at the beginning of 1997, though, when Verity will release specialised engines at lower prices with no royalty overhead.

► Verity UK: 01372 747076 ► URL: <http://www.verity.com>

# N

Developers building transaction-intensive client/server applications on **OpenVMS** will benefit from the significant performance enhancements offered by the new **DSM 6.5** database system from **InterSystems**.  
Tel: 01753 855450

The latest version of the **EasyER** database design tool from Evergreen Software Tools supports Raima's **Velocis** server. The tool provides entity-relationship modelling along with OO techniques like OMT and UML.  
URL: <http://www.esi.com>

**Oracle** has announced version 2.0 of its client/agent/server software **Mobile Agents**, with gateway support on Solaris, SunOS and NT. The SDK has samples including a mobile Web browser, file transfer utility and a stand-alone faxing application.  
URL: <http://www.oracle.com>

Developers using **Visual C++**, **Delphi** and **Visual Basic** for 32-bit targets can now add fax capabilities to their applications using **Fax Plus 2.0** from **Contemporary Software**. The software, which supports ActiveX, VBX and 16 and 32-bit DLLs, costs £195 from Contemporary: 01344 873434

**Rogue Wave** has announced **JWidgets 2.0**, an enhanced version of its Java GUI control collection. Six new controls have been introduced, including status and progress bars, and a directory tree control. Available for £89 from Hypersoft on 01273 834555



# N

Library specialist **Rogue Wave** has brought portable multi-threaded development to C++ with its **Threads.h++** class library. The library provides synchronisation and communication classes for platforms including NT, AIX and Solaris. Pricing is £595 per user, and £295 for one year of upgrades and support, from Hypersoft: 01273 834555

Installation software for Windows versions from 3.1 to NT can be generated without programming by **Sax Setup Wizard 2.0** from Sax software. The tool includes support for ODBC, DAO and self-registering components. Available from Contemporary Software: 01344 873434

Adding to its catalogue of client/server migration tools, **CST Ltd** has announced **VBSys**, an automated tool for migrating legacy systems to **Visual Basic**. The system uses CST's customisable rule-based knowledge base to go beyond conventional front-end oriented tools. URL: <http://www.cst.co.il>

The **World Wide Web Consortium** has announced the completion of the **Joint Economic Payments Initiative**. URL: <http://www.w3.org>

**ImageFX** has brought broadcast special effects to ActiveX with the **PlanetFX** suite. Web designers can use all standard file formats, with over 100 effects including wipes, splits and rolls. PlanetFX is available for £215 from QBS (0181 956 8000). URL: <http://www.imagefx.com>

## Optima++ soon to support Java

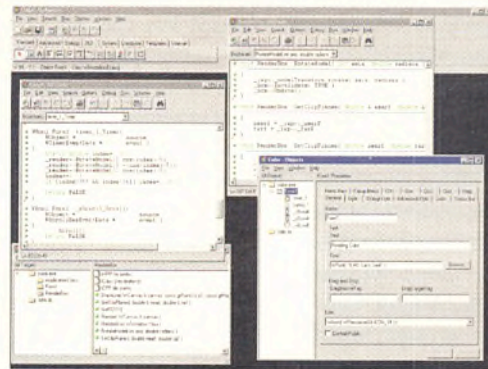
At its recent developers' conference, Powersoft unveiled the new version of Optima++, its C++-based RAD tool. Version 1.5 brings the ease of tools such as Visual Basic to C++ developers. The whole of an application can be built with drag and drop technology, with visual help on finding available methods (in the shape of reference cards) and function parameters (courtesy of the function wizard). Powersoft claims that users can build complete Windows applications even with nearly no prior knowledge of the Win32 API.

The environment includes support for building ActiveX controls and servers on both Windows 95 and NT. Also previewed was the upcoming Version 2.0, which will add support for Java technology.

Optima++ generates optimised 32-bit code, with a compiler based on proven C/C++ technology from Watcom. A royalty-free Sybase SQL Anywhere is included for deployment of database applications.

The Developer edition (£139 until 30th December) includes data aware (ODBC) controls and a visual SQL editor. The Pro version (£344, as above) adds the DataWindow component, Internet controls, and team development interface hooks. The Enterprise edition (at a list price of £1379) adds native drivers for most databases, InfoMaker query and reporting tool, and the ObjectCycle version control tool.

► Powersoft 01494 555599 ► <http://www.powersoft.com/>



## DirectX 3.0 provides 3D audio and network support

Multimedia developers can take advantage of new multiplayer and 3D graphics capabilities in version 3.0 of Microsoft's DirectX family of APIs. After the intensive pre-holiday 'Meltdown' testing event in August, the DirectX 3.0 SDK is shipping as part of the Microsoft Developer Network development platform. Currently, support for the full API set is restricted to Windows 95, but DirectX is slated to become part of the Win32 standard.

Multiplayer games played over online services and the Internet (with transparent connectivity) are supported by the DirectPlay API, which allows users to play within online meeting places called 'lobbies'. The DirectSound API features full-duplex audio drivers and a kernel mode mixer, promising enhanced performance of 3D positional sound.

DirectInput and DirectDraw provide controller input and 2D graphics functionality, and the Direct3D API integrates both low-level polygon and vertex rendering capabilities along with a high-level API for manipulating 3D scenes. The new version includes an MMX-enabled rasteriser for Intel's next generation of CPUs, as well as improved RAMP colour allocation. It is available on Windows NT 4.0.

► Microsoft: 01734 270001 ► fax: 01734 720002

► URL: <http://www.microsoft.com/mediadev/>

## New from JYACC: Prolifics, and... Prolifics.

Client-server specialist JYACC has set up Prolifics, a new company centred exclusively on three-tier Web application development tools. Its first launch is the eponymous Prolifics 1.0, a development of JYACC's original JAM/Web technology.

JAM is a traditional, two-tier client-server development environment which was extended to work with Web clients earlier this year. The new middle tier is JetNet, based on Tuxedo transaction processing software. Prolifics claims that JetNet produces far faster throughput than would be possible with a traditional HTTP/CGI or NSAPI/ISAPI solution.

The server development software works along regular GUI-painter and Visual Basic lines, with the minimum of actual coding required. Databases, forms and queries can be built entirely graphically using pre-defined objects, with both user-defined and pre-defined objects being stored in a custom repository for easy re-use. It is claimed that this combination of RAD and OO techniques reduces development time considerably. At present, the transaction server software runs on Unix, and the development software on Unix and Windows NT. It is even possible to develop Prolifics applications over the Web with the development software running locally and the server remotely.

Prolifics President Frank Vafier visited EXE recently and, over lunch, demonstrated the construction of an airline seat-reservation application from scratch. We believe this is the first time that a three-tier client-server application has been entirely developed in a Soho restaurant.

The development tools and transaction server are available immediately, with the Web application server (which will increase the potential range of back-end applications) due by the end of the year. A five-user development license costs \$35,000.

► Prolifics: 0171 786 9555 ► fax 0171 786 9556 ► URL: <http://www.prolifics.com>



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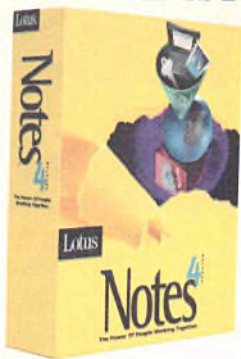
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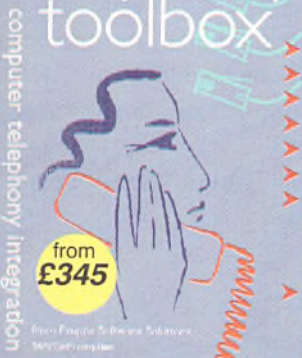


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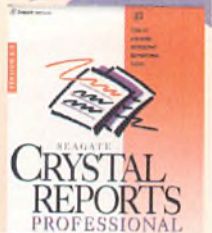
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## Graphics support in 30 minutes

**A**ccuSoft claims to support more graphics formats (over 45) in its ImageGear product than any other imaging toolkit. It is backing up this claim with the 'AccuSoft Image Guarantee', stating that if an image file cannot be handled, its engineers will develop the code to make it work, providing the image is valid.

The ImageGear toolkit, now in its version 6.0, has over 200 APIs, ranging from very high-level functions for loading and displaying images to low-level ones, for example to display an image from memory with a provided rendering algorithm. Internally, all images are converted to DIB, and the toolkit provides transparent access to non-standard tags' content. ImageGear exists in two versions: the Pro Gold product offers faster loading and display, and support for features such as DirectDraw and Alpha channels.

According to AccuSoft's sales figures, LZW-based GIF and TIFF image formats are still doing very well. The LZW code is encrypted, and a key is supplied once the user proves that he has licensed the algorithm from Unisys. Scott Warner, AccuSoft's president, asserts that the relative failure of PNG is because it's too complicated compared to GIF. (*Stop Press: The W3C just ratified PNG as one of its supported standards.*)

ImageGear and ART (an annotation and redlining tool) are available as DLLs, VBXs or OCXs. They can be downloaded from AccuSoft's BBS and Web site, and are activated over the phone. AccuSoft states that the whole process takes no longer than 30 minutes from any part of the World.

Prices range from \$495 to \$1995 <http://www.accusoft.com> A licence fee is applicable after the first 25,000 copies for the standard product, and after 50 copies for the Pro Gold version.

AccuSoft: 01494 539340



## Sapiens to extend ObjectPool support to Unix and NT

**I**sraeli company Sapiens has completed the port of its IBM 370 client/server development environment to Unix. ObjectPool uses a three layer paradigm: the physical schema, application logic and user view are kept completely independent from each other, while the object modeller lets developers adopt an iterative approach to the architecture, design and construction processes.

The next server platform to be supported will be the AS/400 in December, with a Windows NT version expected in 1997. Next year will see ObjectPool gaining the ability to serve Web browsers, by generating HTML frameworks and small Java applets for data entry validation.

Most of the development environment is actually written within ObjectPool, bootstrapping itself over the native core code, which is written in 370 assembler. When Sapiens decided to implement support for other platforms, its goal was to have only a single source base to maintain, while retaining optimum performance on the IBM mainframe. In order to keep the common core in 370 assembly, Sapiens produced Falcon, a tool to convert 370 assembly code into ANSI C. The program can perform complete conversion, handling POSIX-compliant system calls and supporting both big and little endian formats, enabling the C code generated from ObjectPool's core to be directly compiled with no modification. Some restrictions are placed on the input, such as the forbidding of self-modifying code.

With the current publicity surrounding the amount of 370 code that must be updated to avoid the year 2000 problem (Y2K), Sapiens is considering selling Falcon to Y2K developers.

Sapiens is on 0189 464000 [news@sapiens.demon.co.uk](mailto:news@sapiens.demon.co.uk)

## Object Design's native Java database

**O**bject Design is launching its ObjectStore PSE series of object database tools, comprising four products in all: PSE and PSE Pro, both for Java and C++. The tools provide single-user client-side persistent storage engines, ie lightweight object databases, with footprints of 250 KB (for the Java version) and 300 KB (for C++). PSE for Java and C++ are both freely available for download, while the commercial Pro versions add multi-database connectivity and transaction-level database recovery features. In addition, with these products developers can access the ObjectStore DBMS directly without having to go through an extra JDBC layer.

ObjectStore PSE Pro for Java and its freeware counterpart are both native Java applications, and share a common API, ensuring the transition between products won't require extra development. The tools are compatible with Sun's JDK, Symantec Café and Microsoft Visual J++. Their C++ counterparts compile for Windows 95 and NT with ANSI C++ and MFC.

PSE Pro for Java and C++ cost \$250 each until the end of the year (\$450 thereafter)

PSE for Java and C++ are both free [Object Design: 01344 458200 http://www.odi.com](http://www.odi.com)



NT network administration specialist **Serverware** is to compile free evaluation CD packages bundling timed-lapse protected **BackOffice** components with ISV demonstration software. The third in the series, including SQL Server 6.5, will be available in November. URL: <http://www.serverware.com>

**SQA** has brought its object testing and recording technology to **Delphi** with **SQA Suite for Delphi**. The tools support integrated script and stress testing, with automated test management in the Delphi environment. A single user licence costs £2200. SQA: 01344 779000, fax: 01344 779555

American cross-development specialist **Maintools** has released **MainWin Test 3.0**, a Unix port of the Microsoft Test tool from Developer Studio. It is available in the UK from **OpenGate** on 01273 270270, fax: 01273 270 271

The latest version of the **C Executive** real-time OS kernel from **JMI** supports DEC's **StrongARM** processor. The development package is priced at £1500, available from **RTS** on 04624 494352. URL: <http://www.mcb.net/rtss>

**Unwired Planet** has introduced the **UP.kit** mobile intranet development package, at a reduced introductory price. The kit is available for \$4995 until the end of the year. URL: <http://www.uplanet.com>



# N

• The latest version of **Great Lakes' WISE** Windows installation system supports NT 4.0 and multilingual installation. It costs £149 from QBS (0181 956 8000), and a working evaluation copy is available for download from <http://www.qbss.com>

• **Continuus Software's CM 4.2** software change management suite is shipping. It is available on Windows 95, NT and various Unix flavours. A server license costs \$9995, with per seat pricing at \$2495. URL: <http://www.continuous.com>

• Reflex technology has launched the **Delta** distributed debugging server developed by **Enea Data** for its **OSE** real-time operating system. The server supports debugging of programs running multiple processors, and can interact with several industry standard debuggers. Reflex: 01494 465907

• **Logic Works** has shipped its first development environment to integrate **Visual Basic** with back-end database design. **DataBOT** tightly integrates with the company's **ERwin** data modelling tool. URL: <http://www.logicworks.com>

• A graphical Java class library with full source code has been launched by **Stingray Software**. **Objective Blend** includes over ten graphical controls including a hierarchical tree control and a masked edit component, with samples and project files for Symantec Café and Visual J++. Price TBA from Hypersoft: <http://www.hypersoft.co.uk>

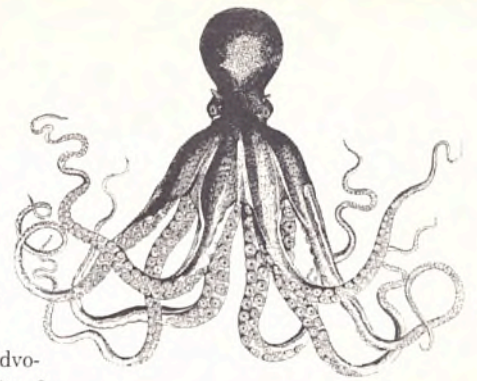
## Developers in need of publisher

O'Reilly is well known for its book publishing business but much less so for its software publishing activities. The company has an original approach to software publishing: right from the start of a project, they set a documentation specialist to work alongside the software developers (ie writing the book about the program at the same time as the program itself). This allows them to shorten the lag between when the code is frozen to the final version of the documentation to only about two weeks.

The writer has an additional role of beta tester and advocate of the user. One of O'Reilly's first projects was WebSite, for which the Documentation Manager Susan Peck helped to design the user interface. To maintain perfect synchronisation throughout the project, the WebSite partnership have had team meetings on a weekly basis (mainly by phone).

O'Reilly is looking for software developers who have already started on an idea, possibly as a shareware product, and who want to develop it further but need more money. Richard Peck, VP of Business Development and MD of the International Division perceives a 'need for software publishers for independent developers' and he wants O'Reilly to fill this gap. According to Peck, conventional software publishers like Microsoft receive so many calls that they don't take the time anymore to listen to all new ideas that come their way. O'Reilly, on the other hand, is open to *all* developers who have an idea and are looking for a publisher.

► If you want to work with O'Reilly, email [sbpeck@ora.com](mailto:sbpeck@ora.com) ► URL: <http://software.ora.com>



## Rational takes on Visual Test, Microsoft integrates Rose

In an unexpected move, Microsoft recently sold Visual Test, its Developer Studio testing and analysis package to Rational Software. According to Ian Gavin of Rational UK, the company will be carrying out all future development work on Test, taking full possession of the source code. The Microsoft personnel who worked on previous versions of the product have been redeployed to other Microsoft projects.

Rational is entering into a close alliance with Microsoft: a lightweight version of its Rose visual modelling tool will ship with future versions of Visual C++ and Visual Basic. A broad-ranging technology licensing agreement gives Rational access to the Developer Studio; existing and future Rational tools will be integrated into the Studio environment and available from within all of its applications. The deal also gives Rational access to Microsoft's object repository technologies currently under development. Plans are afoot for the company to add in change management features to Microsoft's Visual SourceSafe.

All this seems set to blur the distinction between which product is Microsoft's, and which is Rational's. Visual modelling technology based on Rose will become part of Microsoft's tools including not only the Developer Studio applications but Visual Basic as well. For a company like Rational, with deep roots in the Unix community, the significance of the alliance cannot be underplayed: Microsoft has had few strategic partners with this level of direct involvement in its development work since IBM.

The acquisition of Visual Test has come as something of a surprise: because of its integration into the Developer Studio, Rational will need access to the current and future versions of the Studio in order to continue developing new versions of Visual Test which can keep up with the other, Microsoft-originated, products. Although a number of products already exist which hook into Visual C++, this will be the first time that an entire Developer Studio application has come from someone other than Microsoft.

► *Visual Test 4.0 is available from Rational at a list price of \$599.*

► *Microsoft is on 01734 270001 ► Rational on 01273 624814*

## C++ client/server with Visual SQL 4.2

Visual C++ 4.x and Visual C++ Enterprise Edition can be transformed into full-blown client/server development environments with the addition of Blue Sky software's Visual SQL 4.2. The tool integrates with the Microsoft Developer Studio to add visual designers, wizards and components for rapidly building client/server applications.

The product includes modules such as the Query Builder and SQL wizard, which provide for creation of queries without the need for programming, and a set of Component Gallery tools including statements, pick lists and customisable queries. A set of client/server extensions to the MFC library is provided, including classes implementing datasheet displays and virtual lists.

Bundled with the product is a copy of Sybase SQL Anywhere, a fully-featured relational database offering an easy migration path to Microsoft and Sybase SQL servers. Database independence is provided by the option to generate ODBC-compliant code.

Visual SQL 4.2 is shipping at a list price of \$1499. Existing users can download a free upgrade from Blue Sky's web site.

► URL: <http://www.blue-sky.com> ► Tel: 001 619 459 6365 ► Fax: 001 619 459 6366



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in a single pack. **Now available on CD or 3.5" - £179**



## Watcom C/C++ version 10.6

Watcom C/C++ delivers a professional, cross-platform 16-bit and 32-bit development system that produces the fastest executables for the widest range of platforms. Using the same integrated development environment, you can target all platforms including Windows NT, Windows 95, Windows 3.x, OS/2 Warp, extended DOS and more. New features include: Blue Sky's Visual Programmer,

MFC 3.0 for Win32 and direct support for popular revision control packages. Special offer only £139



## Microsoft Visual J++

Visual J++ gives developers what they want from Java, an easy language, multi-platform targeting, and the power to leverage COM and ActiveX, with the most productive Java environment available, including: the best selling Developer Studio IDE, the fastest Java compiler in the world and a best of breed debugger **£79**



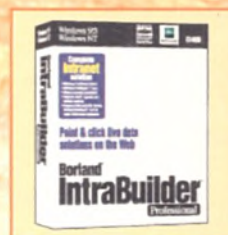
## VtoolsD from Vireo Software

A C library and C++ Class library of functions for developing Windows or Windows 95 Device Drivers. The Quick VxD code generator automatically writes the VxD skeleton, custom header files and libraries automate segment management and expose VMM functions to C & C++ programmers. Debug and

final release libraries are included. Combine with Nu-Mega's Soft-ICE/W, to get the complete VxD build and test solution.

## Borland IntraBuilder Pro.

New IntraBuilder Professional is the only point & click live data solution that delivers the capabilities of your relational database to the Web. Query, update, and create live data over the Web with forms, reports, and JavaScript applications that are always up to date. Includes a Web server and supports all major Web server standards, local database standards, and MS SQL Server. **£349**



## Optima++ Professional

Optima++ Professional supports serious client/server development - including a DataWindow Builder, a Visual Query Editor, and direct connection to ODBC for high-performance access to desktop and enterprise DBMSs. It also includes a 3-user Sybase SQL Anywhere server for building and testing multiuser applications. Optima++ Professional has new team development features, with an integrated check-in/check-out facility with version control interfaces for PVCS, MKS etc. **£349**



## BoundsChecker Professional

BoundsChecker Professional redefines automatic error detection for C/C++ developers using Windows 95 or NT. Professional Edition has breakthrough technologies to capture even more information, with extended API compliance checking. Integration into the VC++ environment, enables BoundsChecker to be used at all stages of development. **New version 4.0** has Delphi 2 support and many new features. **from £445-PS.** Soft-ICE/NT now shipping. **£575**



## MKS Toolkit ver 5.1

MKS Toolkit gives Windows NT3.5+ and Windows 95 developers a full suite of powerful UNIX tools including KornShell, awk, awkc, vi and visual diff for Windows, make, a windows scheduler, grep, sed, tar, cpio, and pax - more than 190 utilities and commands for performing a variety of computing tasks, with support for NT & 95 long filename. For Win 95 & NT-Intel, Alpha, Mips on one CD. **£239**



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# Letters

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

## Abductions

'  
They came for the dot  
...  
They came for the quote  
...  
Aaagh.. what next?  
:)

*Jim Daley*  
[jdaley@cix.compulink.co.uk](mailto:jdaley@cix.compulink.co.uk)

## About OS size

Dear Sir,  
Without wishing to start an interminable 'which is the best OS' debate, I'd like to correct Martin Brampton (*Letters*, October issue). He said 'Merlin will run perfectly well in 16 MB, which is now essentially the standard for any graphical OS.' AmigaDOS runs perfectly well in 2 MB – the OS itself (a graphical, quasi-realtime, multitasking system) is only 0.5 MB in size.

*Adrian Barnett*  
[adrian@abarnett.demon.co.uk](mailto:adrian@abarnett.demon.co.uk)

## A Postscript virus?

Dear Sir,  
Your October 1996 issue of *EXE* was very interesting – interesting because of the complete lack of apostrophes and other punctuation more esoteric than the humble comma or full stop!

Could there be a punctuation eating virus in the printer software?

*Steven Digby*  
*Email address supplied*

## Recursive acronyms

Dear Sir,  
Since I see a side-bar on recursive acronyms (October *EXE* p. 34), it occurs to me that your readers may enjoy the following, which I modestly offer as the ultimate: TIARA (TIARA is a recursive acronym). Remember, you read it here first.

*Chris Smithies*  
[Chris\\_Smithies@penop.com](mailto:Chris_Smithies@penop.com)

## A video recorder story

Dear Sir,  
I thought it would be nice to take Jules to task on one of his pronouncements in the July issue. I quote: 'But a video recorder can

be absolutely certain that it has access to a screen, ...' – woolly programmer thinking if ever I saw it.

May I relate the following cautionary tale that happened to an ex-colleague of mine. About 10 years ago he had one of these new-fangled recorders that used the TV as its display screen. And he was desperate to record his favourite programs, because his TV had broken down... OOPS!

*Anthony W Youngman*  
*London*

**So, how on earth did your friend expect to watch the programme he'd recorded? – Jules**

## Missing from last issue

Dear Sir,  
Not only have you lost the '.' but you seem to have lost all ""s as well. Perhaps David Mery should have kept quiet :-)

*Steve Lee*  
*Email address supplied*

**Perhaps! – Ed**

## A global approach

Dear Sir,  
I'm sure you have seen nature documentaries showing how much of life in the animal world is dominated by stiff competition, fear and hunger, with every animal attacking others and in turn being attacked by superiors. The IT industry seems very similar. Every software vendor facing the continual challenge of competition, fighting it out in the marketplace with companies pushing products similar to their own. This is an animalistic behaviour that one might attribute to an absence of rational thinking, but surely people proud of being human (specifically those in the IT industry) are supposed to value the logical and rational approach.

Considering the resources put into applications, is it really necessary for many sources to work on similar products when in the end only one will be used in significant numbers, and the others dumped? Can't we achieve more from the efforts of others?

I believe that taking a global, unified approach to addressing application areas would be more beneficial for everyone, and save massive amounts of wasted effort. I agree that this might lead to monopolies, but

this need not necessarily be of the type of negative monopolies the industry emerged from in the 1970s.

*A Ramasharma*  
*Email address supplied*

## Year 2000 problem

Dear Sir,  
Although I have no direct involvement with this problem, I have followed many articles on it with interest, and it appears to me that it is being tackled in a very crude and uncoordinated way. As I understand it, thousands of companies are having to make radical changes to many programs in order to increase the capacity of data fields allocated for storing dates. This requires examination of every piece of code that accesses date information, an expensive and possibly unreliable process.

Surely it would be simpler and more reliable to change our language (and compiler) standards' definitions of how dates are stored, so that dates from the next millennium could be stored in the same amount of space as at present. This could be done in such a way as to make as much existing code as possible work without alteration – after all, most code that operates on dates is probably only performing fairly simple operations. In the best possible case, companies would only have to recompile (or even relink) their programs.

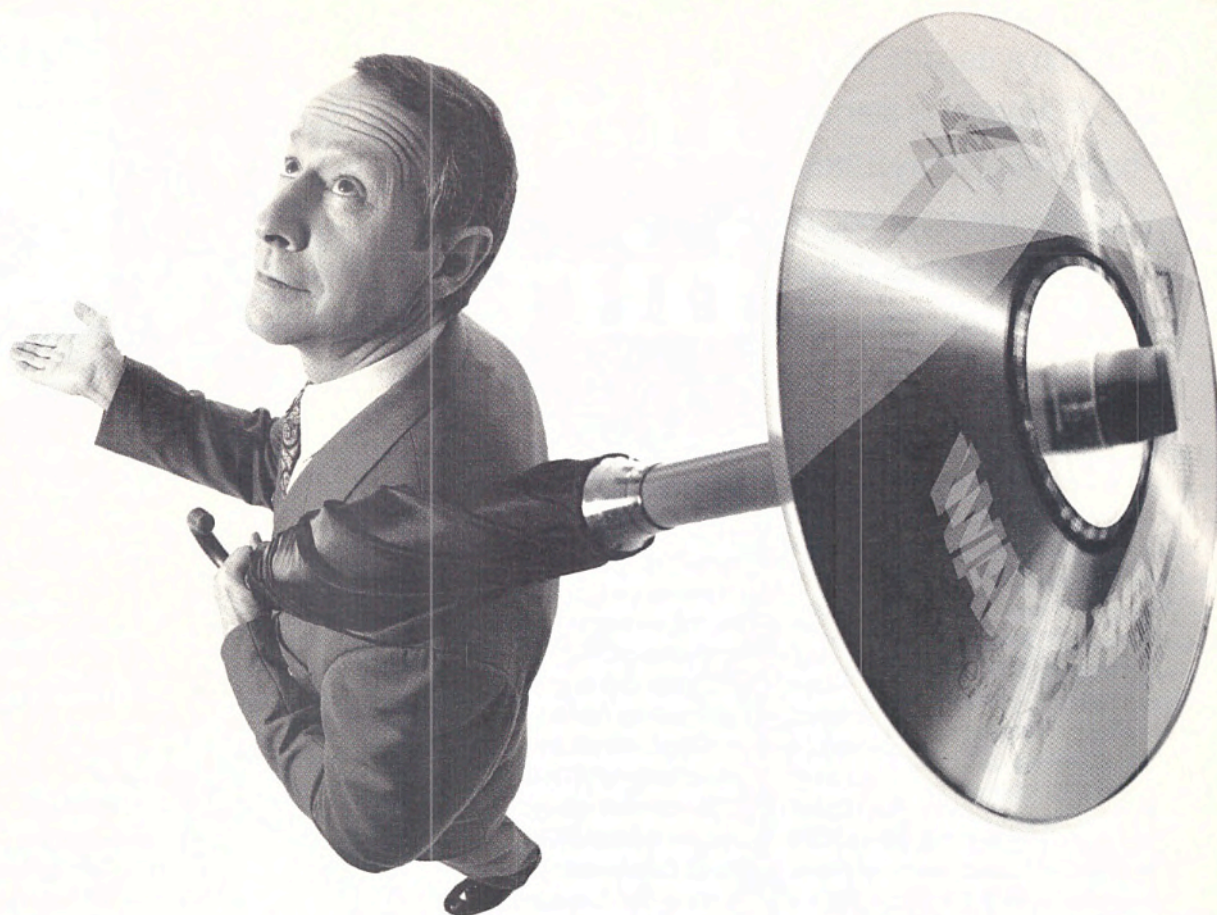
The required changes would depend on the languages involved, but an obvious approach would be to represent years after 2000 with non-numeric characters, eg '0', '1' etc. (I have chosen '.' because its ASCII code 0x3A is one higher than that of the digit '9'). Obviously, this would require changes to the library routines, but I suspect that much existing code for comparing/calculating dates would still work. I'm afraid (or should I say relieved) to say that I've forgotten all that I ever knew about Cobol and PL/1, so I can't say how effective this would be, but I'd be interested to hear what experts in those languages think.

Has anyone tried to solve the problem in a similar way to this? Could it work?

*David Hughes*  
[david@drivet.demon.co.uk](mailto:david@drivet.demon.co.uk)







"I started running OS/2 Warp Server on all my networks and guess what?

## My rainy days are over."

### **Umbrella**

It was time to consider consolidating his mixed environment network onto a single operating system, so Steve Conaway, Director of Computer Services at the Financial Times, decided to check out the new release of OS/2 Warp Server. In no time at all, Steve was waxing poetic over OS/2 Warp Server's ability to handle blockbuster-sized databases and make Internet and Intranet access a breeze. He was also impressed with all the advanced printing capabilities and management features that simplified the running of both his network and his life. From now on, Steve definitely regards his OS/2 Warp Server as his umbrella network operating system.

To find out what got Steve so excited, call **0800 96 90 45** for your free 60-day evaluation copy of Warp Server, or you can visit our web site at [www.software.ibm.com/info/ws031](http://www.software.ibm.com/info/ws031).

What's more, if you buy both Warp Server and Lotus Notes before 30th November, you can save hundreds of pounds. There's no better way to demonstrate fiscal responsibility.

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 CIRCLE NO. 897



It's been a decade since  
EXE Magazine started  
back in February 1986.  
With this issue we begin  
the celebration of our  
10th birthday.

# Happy birthday



The first issue

*EXE has evolved since its first issue when it was called .EXE. The staff has changed too. Apart from Kate who spent most of the past ten years with the magazine (except the first few months), EXE has seen a number of developers and journalists alike working for it along the years. Most of them spent a couple of years with EXE, the one exception bringing about the complete redesign, the initial dot disappearance and the ensuing horrified reaction (especially from those who were on Cix). To celebrate these 10 years, I asked some of the individuals who have left their mark on the magazine along these years to tell their story of 'my time at (.)EXE'. Below is a collection of anecdotes that happened during these lively 10 years. - Ed.*

## Instantiation

Our beginnings were singularly inauspicious. We had limited funds, not an overwhelming wealth of talent and strictly finite resources of every kind. Our strength if we had any at all, was in our conviction that there was a body of dedicated people out there, expending their energies and creative talents fashioning the complex code which in the fast-developing world of IT, would lead to providing the greatest contribution to this country's future wealth creation. And in this country, while the DIYers, the train spotters, horticulturists, lawyers and art lovers all had a wide range of journals to satisfy their interests and cravings, software developers had very little.

We didn't arrive at this conclusion all by ourselves. There were people like Ian Rangeley of Grey Matter, Peter Lindsey from System Science, Paul Bailey and Frank Iveson of Digital Research, Jim Watts of QA Training, Gary Levell and Phil Buggins of Microsoft and many others who were prepared to submit to our interrogations and all of whom shared the conviction that there existed the need in this country for a publication which, like PC Tech

Journal and Dr Dobbs in America, would satisfy the interests of the software developer. Equally important, it was felt that there were enough new development tools and related products being brought into the world to make such a publication commercially viable.

Armed with these convictions, a few thousand of our own hard earned pounds, two Apricot computers with 10 MB 'fixed' disks running a version of dBASE II unique to Apricot, and the determination to make it work, we set to in October 1985 to compile an initial distribution list approaching 30,000 names. The data emanated from a wide range of sources. Mostly from people who, with much good will, felt that they were making a contribution to a worthwhile cause. Needless to say, because the addresses came from a wide range of uncoordinated sources, we were entering an impossibly high number of duplicated names. Our overwhelming concern was to build the numbers, and the art of de-duplication was unbeknownst to us at that time.

It was only when we were fast approaching publication date and began to look at clever ways of identifying repeated names that we realised the number of records in the database, shared between two hard disks, even vaguely related to the number of names

we could use for the first mailing. Postcodes had been in use for some time but they were treated half heartedly by most people. There was not the same incentive for individuals, or even large volume mail distributors to use them. They do provide a useful means of identifying repeated addresses since, apart from a surname and initial,

the postcode is the only constantly fielded data string to use in comparisons. Company names could, it seemed, be interpreted and spelled with such a wide range of imaginative options that they proved highly unreliable for the purpose.

So not only did we spend a great deal of time entering addresses, we also spent time manually checking for duplicates on screens seemingly half the size of today's and in a phosphor green colour designed primarily to improve opticians' revenue expectations. When the database seemed as near to usable as it was likely to be in the short term, we then sought to produce the Cheshire labels required by our magazine distributors. We realised that this was not the sort of thing to be undertaken on our Epson RX-80 and that creating the routines to reliably produce four variable length addresses across a 14 inch page of 32 addresses per page for about 800 pages was also beyond our technical ability. Needless to say, dBASE II didn't provide that facility as standard.

We approached our local Apricot consultancy well ahead of the appointed day, initially to discuss the implications of the task. Did they have the hardware and associated resources to undertake the project? They recognised the potential of a once monthly overnight non-attended revenue earning opportunity and invested in a printer able to accommodate the paper width and faster than your average dot-matrix of that era. They had conducted tests on extracts from our files which had been successful, they said. We didn't actually see the printer performing until the day before the first issue was due to be printed, bound, polythene wrapped and addressed, in one highly mechanised and strictly scheduled industrial operation.

When I casually wandered in to see how this highly significant first address print run was progressing, I couldn't believe what I was seeing. The print quality was fine, every address was perfectly registered and a hundred or more pages had been printed. A factor of not inconsequential concern however, was that having printed an address line, the print head hesitated for an age waiting for the poor old Apricot to process the next line. It wasn't that the computer was not up to the





**EXE**  
YEARS

task: after all, it had a 8086 processor and half a megabyte of RAM. The failure lay to a greater extent

at the door of the inelegant programming created to ensure that every address however long or short, fitted perfectly into its allotted position on the page without blank or truncated lines. All of these things were achieved but at what price? A quick calculation confirmed that we were not going to get it on the last Red Star train out of Paddington that night to be in Cornwall for the following morning's production run. With a heavy heart, I visualised this massive plant idly standing by awaiting our labels, with estimators eagerly calculating our penalty charges. And all this before a single *.EXE* had seen the light of day.

Our printers were extremely understanding. They were well aware of our limited experience and despite dealing with the country's major publishers for most of the time, were thankfully prepared to hold our hands during that initial period. The magazine was finally distributed a day late, but with some judicial rescheduling, we managed to avoid the penalty charges they were entitled to levy. We had reached our first real landmark, it now remained to be seen how our creation would be received.

A very few days later, we began to realise that not only is this a highly volatile industry we're in, where people move about with great rapidity, companies too came and went in quick succession, even at that time. The inevitable consequence was that we had an unbelievable number of returned magazines with the postman's comment on each one of either 'gone away' or 'no such address'. It is not unusual in high volume mailings to have a high ratio of returns. But we didn't appreciate that at the time and it was highly disconcerting to see all that hard earned cash squandered on wasted printing and postage costs, amounting to many thousands at a time when a thousand was a thousand.



Thankfully, it wasn't many days later when our rewards began to come through. Well known and highly regarded industry personalities sent us their congratulations and good wishes and, in the main, told us that this was just the magazine the industry had been waiting for. Equally as important, we were receiving real cash from the dedicated who judged *.EXE* Magazine to be worth the £35 annual subscription, and this was happening in numbers sufficient to reassure us that we had made the right decision. It took

task: after all, it had a 8086 processor and half a megabyte of RAM. The failure lay to a greater extent at the door of the inelegant programming created to ensure that every address however long or short, fitted perfectly into its allotted position on the page without blank or truncated lines. All of these things were achieved but at what price? A quick calculation confirmed that we were not going to get it on the last Red Star train out of Paddington that night to be in Cornwall for the following morning's production run. With a heavy heart, I visualised this massive plant idly standing by awaiting our labels, with estimators eagerly calculating our penalty charges. And all this before a single *.EXE* had seen the light of day.



Thanks to Chris Duggan for all his wonderful pictures over the years.

time for the advertisers to arrive at a judgement on the success of their responses. They aren't known ever to express overwhelming enthusiasm but when it came to repeated entries, again, the outcome was encouraging. The rest, as they say...

Congratulations (.EXE on your 10th.

*Ian Adams was editor of .EXE from its inception until October 1987. He then took over responsibility for the subscriptions and was fondly known by his colleagues as 'Database Dad'. He maintained the cleanest mailing list in the West.*

## Version control

**I**t's *.EXE* and I get a BMW, I remember saying to Nick, my colleague at PCW magazine where I was working in late 1987. He was one of the few people in whom I'd confided about a rather strange telephone call I'd received the previous week.

I'd been contacted by Ian Adams, who asked if I'd be interested in editing a magazine and would I like to meet him for lunch. I agreed, and enjoyed a rather nice piece of calves liver in a blue-fronted restaurant in Soho. The man I met was actually Mark Adams, Ian's son and the founder of *.EXE*.

We chatted about the magazine and the state of software development. Apparently, Mark had asked Text 100 (Microsoft's UK PR agency) if they dealt with any journalists who were sufficiently anorak-endowed to edit *.EXE* and my name

had come up, probably because I was the only one who'd called and asked for a review copy of MASM 4. Thankfully they'd clearly forgotten how I had to call and ask for another copy the following day, after accidentally wiping the floppy while copying it to my hard disk.

A couple of months after the lunch, I said goodbye to PCW on Friday afternoon and arrived in Chiswick the following Monday at 8.15am. I'd allowed 2 hours for the drive, which had actually taken 45 minutes. Still, there's no harm in being punctual.

I was given two weeks to plan the second phase of *.EXE*. Phase 1, started by Mark and family, was to launch and establish the magazine. This having been done, it had apparently been decided that a proper editor was required, hence the calves liver. In those two weeks, while the existing staff finished off the issue they'd been working on, I planned the next one. And indeed the next dozen or so. It consisted of deciding what topics

needed to be covered, and then finding qualified people to cover them. Out went Vax and 68000 – I decided that we needed to concentrate on MS-DOS, 80x86 and C. That was, after all, what 75% of our readers were using as a primary development system. In the early stages, I also created some places in the magazine where I could publish my neat machine code hacks, such as the Code Page.

(Ah, those were the days, when reviewing an OS meant disassembling it and looking for undocumented commands and Int 21h calls).





My first editorial column was, as is traditional in such circumstances, along the lines of 'it's your magazine, so tell me what you want in it'. I never explicitly mentioned that three years before I'd been prosecuted for computer hacking, but one person was sufficiently shocked to write and complain and to cancel their subscription.

If I'm remembered for anything at *EXE*, it's probably for bringing some order to the proceedings. Editorial planning was non-existent in early 1987 – whatever happened to get sent in by readers or advertisers got published. If there wasn't enough material to fill the pages, Mark would approach his friends in the industry and words would arrive by fax, to be typed up by whoever happened to be free.

Under the Schifreen regime, we had plans. Everyone knew what articles were going to be in each issue, and the stage of the production process which each had reached. I've never been able to work in what's euphemistically called organised chaos and I certainly wasn't going to let poor planning and last-minute panics spoil my first job as an editor.

My 3 years at *EXE* was a wonderful opportunity to work on a great magazine with some great staff, and to meet some very loyal readers. The highlights? Getting to interview influential people such as Philippe Kahn, Gates, Peter Norton. And the famous *EXE* readers' meeting, when we extended an open invitation to readers to turn up one evening and, in return for free beer and sandwiches, tell me what they thought of the magazine. We had around 60, I think, which cleared out most of M&S's sarnie rations that day.

Any regrets? I'll never forget the time when the proofs for the next front cover looked awful and I was told I couldn't spend £100 to have it re-done. Never one to miss an opportunity to make a stand, I wrote out a personal cheque and the cover was re-drawn. My money was refunded shortly afterward, and no more was said.

And I never did get the BMW – something to do with problems insuring people under 25. Still, the Sierra was fine.

*Robert Schifreen joined EXE in November 1987 as deputy editor, he became editor in January 1988 and remained steadfast at this post until June '90. He is more well-known for the Great Prince Philip Prestel Hack. The complete text of the judgement as handed down in the House of Lords on 21st April 1988 appeared in the June '88 issue.*

## Hacking

Well, I'm sure this is too late, but, hey, some things never change... [Things have changed: Dan's piece arrived long before the others – Ed panicking.]

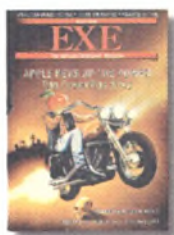
My time at *EXE*? It's hard to remember exactly what happened at *EXE*. I remember... I was a sprightly young thing, straight out of college, where I had spent three years sniggering at Stob in the 'special room' where the librarians kept the really hardcore technical magazines. I remember applying for the job. I do recall thinking 'well, this should be a cinch – knock off a few compiler reviews, make up a few stupid puns for the news, and collect the cheque'. Money for nothing, and my Cix for free, I thought. Then it goes black.

Occasionally I wake up in the middle of the night, now, with a sweaty image of leaving the three pages of a news section on the bus, and having to write it practically from memory in an afternoon. Or visions of a time, two months into some job or other, when I blew up a Unix server, merely by touching it in an unusual way ('Is that burning I smell?', somebody who looks like Robert Schifreen asks in my dream, 'Shut up', I repeatedly explain). Or else I listen to a shadowy Will Watts tell a prominent businessman that I am giving his product a bad review because it really *is* rubbish, as I, untouched and unbiased, continue to work on the article from under my desk. I have odd recollections of jemmying up on APIs whose version numbers would change as I stared at the spec notes. And I have a blurred image of the Barley Mow pub. A very unusual image, taken from a very unusual angle.

But most of all, I have this recurring image of a small team working together under huge stress, journalists who knew what they were doing spending their spare time helping a junior reporter who didn't, and a magazine that demanded a ridiculous amount of intelligence from its writers, because of the frankly preposterous intelligence of its readers. I don't remember much – but I do remember that.

*After escaping from the EXE high security prison for a crime he didn't commit, Dan O'Brien <danny@cityscape.co.uk> went on to write and perform a one-man show, Caught In The Net at the West End. Techni-*

*cally he's now a writer and broadcaster – just like Ned Sherrin. He still knows the DPMI API, and edits the militant geekzine Need To Know.*



## Memory mapped I/O

Cast your mind back, gentle reader, to the early weeks of 1991. Thatch had been toppled from the throne for but a few months, Saddam's forces were encamped in Kuwait, and Borland Germany was planning an OO Software Festival the like of which the world had never seen. In among the usual daily press releases, I got a brochure describing the occasion: a two day celebration of object orientation was to be held in Munich (said the brochure) with numerous speakers including Pascal/Modula-2 inventor Niklaus Wirth, Xerox PARC genius Alan Kay, C++ guru Bjarne Stroustrup, Joseph Weizenbaum (inventor of the Eliza program that fooled people into believing in AI with depressing ease) and legendary MIT AI expert Marvin Minsky. God, the brochure seemed to imply, had offered to put in appearance, but had been turned down on the grounds that He had insufficient coding experience. Borland President and CEO Philippe Kahn was going to be on hand as MC.

It looked good. In fact, it looked excellent. I put in some in-depth toadying. Borland's PR man 'Andrew Smith' (as I shall call him) and Borland UK's Matt Price proved pliable; and thus it was a week or two later at 8.15am I was among the half dozen assorted British technical hacks shuffling into a large theatre in Munich's main arts and leisure centre. We managed to squeeze into some decent seats at the front just as Philippe Kahn introduced the first speaker: Niklaus Wirth, who was going to talk about his Oberon operating system.

The first snag was foreseeable. Almost as soon as Prof. W started speaking we noticed something was wrong. Smith – the hardened old PR expert – was first to articulate it. 'He's speaking German!' he exclaimed. We held a hurried whispered conference. It was established that our party had an aggregate German vocabulary of nine words, this including two ('Schmels goot!') gleaned from a racist British TV commercial for decaffeinated coffee.

'Why don't we just sneak out?' suggested the ever practical Editor of PCW.

'We can't do that!' I hissed piously. 'We can't walk out on the man who devised the Pascal programming language! Besides, everybody will look at us.' But I was wrong.





## Setup Checklist

### Set the Visual Design

- ☐ Application Information
- ☐ Main Window
- ☐ Features

### Specify InstallShield Objects

- ☐ General Options
- ☐ Advanced Options

### Specify Components and Files

- ☐ Groups and Files
- ☐ Components
- ☐ Setup Types

### Select User Interface Components

- ☐ Dialog Boxes
- ☐ InstallShield Extensions

### Make System File Changes

- ☐ Private INI Files
- ☐ System INI Files
- ☐ AUTOEXEC.BAT
- ☐ CONFIG.SYS

### Make Registry Changes

- ☐ Keys
- ☐ Values

### Specify Folders and Icons

- ☐ General Settings
- ☐ Advanced Settings

### Run Disk Builder

- ☐ Disk Builder

### Test the Installation

- ☐ Test Run

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Surely it can now be safely stated that Oberon the operating system, at least in its initial version, was not the hottest of Prof. Wirth's ideas. A black-and-white GUI without overlapping windows that ran only on hugely expensive workstations might have impressed a few years earlier, but this was well into the Windows 3.x period... At any rate, after about ten minutes, the Professor's audience began to desert him.

And how they went! You know how one sneaks out of the cinema or theatre or lecture in the UK: all tip-toe and whispered apology and crouching down to avoid blocking the view. Not so in Munich. The first bloke out merely banged the door as he quit, the next group started chatting to each other as they walked down the aisle, and soon the whole theatre was full of talking and banging and stamping, so that Wirth had to shout into the microphone. This seemed to go on for an incredibly long time, as if those making noisy exits were sneaking in again at the back for another go.

It seemed like no way to treat a genius, but after 20 minutes, we joined the throng, defeated not so much by the German language as proxy embarrassment for the speaker.

The next lecture was to be from Alan Kay, sage of Xerox PARC. Once again Philippe Kahn took the stand. Mysteriously, instead of getting on with the introduction, Kahn started waffling on about a forthcoming release of Quattro Pro. Five minutes passed, and then ten, and then twenty. Philippe bumbled on about some interesting new @ functions that had been implemented, and how you could now edit 3D charts. The audience became increasingly restive. Finally, a young man stood up and interrupted Kahn's cant:

'Excuse me, but I am coming here to see Mr Alan Kay. Ven will he be talking?'

Kahn then admitted that Kay, afraid that agents of Saddam Hussein would blow up his plane mid-Atlantic, had stayed at home in the US. We'd been waiting for Godot. This went down a storm with the audience, who promptly swept out *en masse*. We allowed ourselves to be swept with them, one of my journo colleagues improvising a rather good Alan Kay song, based on the 'Brave, brave, brave Sir Robin' ditty from *Monty Python and the Holy Grail*.

And so on all day. Every one lecture went wrong or was strange or embarrassing. Marvin Minsky came on like Norman Wisdom on bad day – artificial intelligence as a second bill variety act. First he dropped his notes on the floor and had to pick them up, then he pretended to trip over the micro-

phone lead, then he dropped his notes and tripped over the microphone and spilled his water. My recollections of Weizenbaum's lecture are so bizarre that I don't trust my memory: if you want to find out what I think happened you will have to buy me a pint. One exception: Stroustrup's talk was apparently straightforward – his standard introduction to C++ – but I couldn't get in because it was too full, so I only have this second hand.

The attendees. Although some of them looked normal enough, a fair proportion – say a third – were got up like Sex Pistol fans: mohican hair cuts, studded leather gear, fearsome tattoos portraying politically incorrect subjects, lots of flesh piercings, permanent scowls. It was as though the Chaos Computer Club, the Data Processing Division of the Anarchists and the Computing Science Department of Baader Meinhof had all decided to take a day off to attend Borland's show.

'Gosh, I wouldn't like to be stuck behind him in the metal detector queue at passport control', said Smith, indicating a particularly fierce-looking individual with metal through his ears, chin, left eyebrow and tongue. 'I bet he's got rings in parts that we can't see.'

'You ask him.'

And so to the evening press conference. It was held in a much smaller theatre in the same complex, and it was *packed*. Word had got round the less ruly attendees of the show that free booze was available to anyone with the wit to scribble 'Press' on his name badge. Consequently the crush was unbearable.

Eventually all the conference speakers had sat down in a line behind a table on the stage. They only had one microphone, which they had to pass between them. 'Wow, I didn't know there were so many journalists interested into C++ in Germany!' exclaimed Philippe Kahn, on the beam as ever. 'Can I have the first question, please?'

They may not have been journalists, but they had seen plenty of press conferences on telly, and they knew what to do. A spiky haired youth with a playful swastika tattooed on his left cheek called out: 'What is the panel's opinion of the Gulf War? Can America's cultural imperialism be tolerated in the 1990s?'

'Errm, I don't think...' began Kahn, at which point Minsky grabbed the mike. 'An excellent question. I'd just like to say...'

At this point, accounts differ. Both

Andrew Smith and I recall Minsky going into a long rambling speech, but I remember him ending up by saying 'Sport is worse than war. We must at all costs ban football, not war.'

Andrew claims he concluded by harking back to WWII in a manner less tactful than Jon Cleese in *Fawlty Towers*. Maybe he did both; in any event we are unanimous as to the effect: the atmosphere changed from reasonably amiable booziness to near-riot fury.

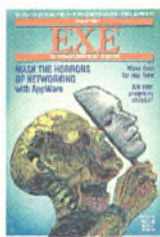
Apparently oblivious to the buzzing and growling, Minsky passed the microphone to Stroustrup. 'What do you think Dr Stroustrup?' Bjarne eyed the angry crowd with the thoughtfulness of one who has a wife, child and young compiler to support. He chose the direct approach. 'I'm sorry, but I do not understand what this question has to do with object-oriented programming.' There was a tense pause, then laughter. The storm had passed.

This set the pattern for the rest of the press conference, which lasted over an hour. When the microphone passed to Minsky he worked the crowd: accepting ludicrous questions and delivering outrageous answers; when it passed elsewhere, panellists tried to calm things down. This game was less fun than it sounds: after a few minutes Wirth decided he had had enough and walked out. Others began to show the strain too: 'Why do you think Alan Kay didn't come?' 'Because he is a coward', snapped Stroustrup.

Finally Kahn grabbed the mike, and announced that he was playing his flute with the Borland band at a nearby bar in a few minutes, and everyone was welcome to come along. Sensing the possibility of more free beer, the crowd evaporated, leaving behind a small huddle of dazed Brits.

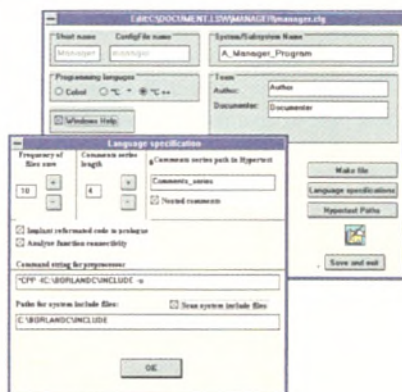
Thus ended my first press trip, over five years ago. If you are wondering why you didn't read this at the time – well, it didn't really fit an ordinary issue of *EXE Magazine*. Sorry I'm late.

*Will Watts worked as a programmer for various companies before being recruited by EXE Magazine. He joined as a Staff Writer in 1988, became Editor in 1990 and resigned in a huff in 1993. However, he was persuaded to return to the now dotless EXE part time for six months in 1995, and was pleased to make friends again. He supports Newcastle Brown Ale and Patrick Troughton's interpretation of the role of Doctor Who.*





## THE YEAR 2000 FOR C/C++ AND COBOL

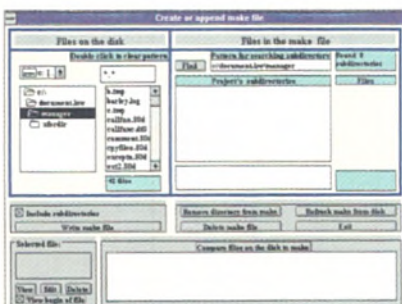


All programmers can write programs but it takes a special type to analyse, change and reuse code. The constant work overload has pushed analysis and maintenance into the background. The Year 2000 has changed all this.

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The LSW Y2K (Year 2000) module has been specifically written to interface with the Hypertext database and provide the users with addresses of code to be changed. The results can be implemented and tested within LSW itself.



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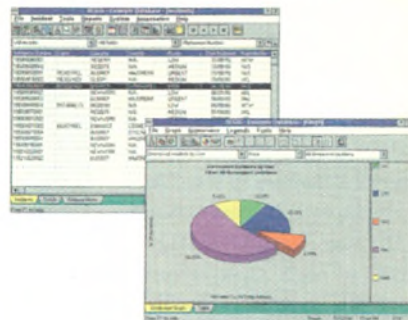
Dr Codd, who created the rules for Relational Databases (RDBMS), claims that RDBMS in themselves are not enough. If you have been using RDBMS to provide analysis solutions for senior management you will know the shortcomings Dr Codd is referring to. TM1 has been providing OLAP software some ten years BEFORE Dr Codd defined the OLAP rules!

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## Naming convention

As the longest serving member of *EXE*, I'm often embarrassed to tell people that I have actually been working on the same magazine now for ten years. In that time, however, I have seen dramatic changes to magazine production – not least because of the rise and rise of DTP. I might as well have been in three different jobs, considering the changes that have occurred. I have had the (sometimes!) pleasure of working with over 40 colleagues.

I started at *EXE* just helping out, but after a month I was lumped into the deep and had to put a magazine together by myself to save money. The whole Adams family ended up working together on the *EXE* project – even the dog did the deliveries. We tried to keep this fact quiet, fearing that we wouldn't be taken seriously, but as is the case in family businesses, we all worked ten times harder than if we'd been unrelated. Nevertheless, on the



*Kate, made long and thin by the magic of DTP, steering the EXE boat on its rough ride through the years!*

masthead I was a 'design agency' called Katey Matey for some years.

Was it really only ten years ago that we were still using text galleys, scalpels and spray mount? I cringe now when I look at the early back issues, with their wobbly, hand-drawn lines and crooked text. We were quite innovative in the early stages in that we actually presented the typesetters with a disk containing the text, as opposed to hard copy which they'd have to type up. Larger publishing houses hadn't even got this far, back in 1987 – the only computer technology they used was WP, if at all! Then a copy of Xerox's Ventura Publisher landed on my desk, we went PostScript, and Corel Draw v2.0 meant that I didn't have to draw around pennies for diagrams anymore. Ventura meant I could dispense with the blades and glue, but was very limited, though, especially

in its handling of colour. It was only when *EXE* moved to Soho and lost its much loved Dot that I changed to Quark XPress, which is the most popular DTP package and indus-

try standard – it changed my life! We save so much money on pre-press preparation, compared to the old days of conventional cutting and pasting and getting pictures scanned at the repro house.

Now I have a wonderful scanner and a nice budget to commission illustrations with.

My priority when organising pics has always been to avoid having any photos or illustrations of computers – you, our poor readers, sit in front of them most of the day; I don't think you want to see many more. With a few groovy illustrations I have tried to provide you relief from what is, let's face it, highly technical and complicated

text. I hope it works.

And we are currently preparing a redesign of the magazine, looking to launch it at the beginning of 1997. Don't worry folks – there won't be too many dramatic changes. Don't tell anyone else, but we've actually discussed reviving that dearly departed Dot – just wait to see what happens....

*Kate Adams, Old Fogey Production Veteran Person [far from the truth – Ed], joined the magazine at about the third issue and has been there ever since.*



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CIRCLE NO. 902



## Virtual machine

Joining *EXE* has been a different experience from all the other magazines I've worked on or the companies for which I developed software. It has been like being adopted by a community. I've witnessed the strong feelings of staffers, ex-staffers, contributors, readers and of some advertisers alike for the magazine. It is one of this unique projects that once you've been associated with it is hard to forget.

In a little more than two years, I've seen the return of Will Watts (not without some unwarranted apprehension at the start) and had the sadness to attend his second leaving do. Will there be a third comeback? Mark English, in the production department, came back to the magazine after having returned home for a few years to fine-tune his Liverpool accent. And of course Verity Stob is for the second time in her career a regular contributor. Many readers who had left us immediately after the dropping of the dot are subscriber again. Kate Adams, Katey Matey or Katerina Adams under her different monikers in the masthead has been with *EXE* for the amazingly long period of ten years. More

recently *EXE* has attracted Neil Hewitt and Mike Ingram who have since revealed that their talents include the mastering of all Quake's weapons (though I won't say who is winning).

What makes *EXE* so special and so different is of course the quality of its contributors, most of whom are professional developers. A few are professional journalists who have a software background (believe me, many different roads can bring you to journalism). The current (and future) *EXE* recipe is based on two ingredients: the subject of articles is always decided with the author, never imposed, that way articles can draw on the wealth of experience of our contributors and be both technical and practical. The other ingredient is to make even the most technical article as easy to read as possible without sacrificing any of the content.

Among our regular columnists – Peter Collinson, Francis Glassborow, Dave Jewell and Jules May – Jules is the contributor who has generated the largest amount of letters received. Some months are more prolific than others but it is rare to

have a month pass not receiving a comment about *Mayhem*. Some other (regular) contributors are probably less visible even though their colourful

work liven up the whole magazine: all the illustrators working for *EXE*.

*EXE* and its little brother *EXE OnLine* will remain the forum for the software developers community in the UK. Do not hesitate to send your comments in or come and see us at the events we attend (the next one being SoftDev/Web-

Deb at the end of the month).

A great many thanks to all who have contributed to *EXE* in this past decade, to readers and to advertisers. As for the future, refer to Verity on page 80...

As Will pointed out in the October '95 issue: 'David is French'. Four years ago, on a rainy day, David crossed the Channel on his motorbike to join his loved one. After having worked both in the industry (writing mainly telecomms software) and participated in many magazines in France and in the UK both freelance and as a staffer, he joined *EXE* two and half years ago. He can often be spotted at hacker's conventions.



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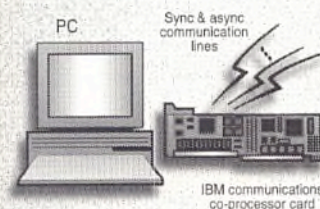
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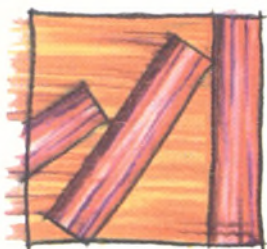
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# Programming projects



David Humphries © Monster

The first implementation of every project can seem like a recurring nightmare.

**Peter Collinson** delivers some homespun advice to help you get a good night's sleep.

**I**n September's *EXE*, I described the design of a network protocol for a project that I am working on. The task involves moving files from some rather important machines to the disks of an optically backed up Hierarchical Storage Manager (HSM). The design phase had identified the need for a control protocol for communication between the client machines and the server running on the HSM, which I eventually based upon the existing Internet protocols.

In this article, I want to pursue the history of the project a little further and talk about the thinking that shaped the initial code, moving from the original design to a first hack at the components that were needed. Much of this falls into the realms of 'what I always do', and that has been developed over 20 years of writing Unix programs.

## The best laid plans...

The project demanded a paper trail of documents, so by the time I began coding I had



already produced several drafts of the design document and had a good idea of the programs that would be required. I have certainly started projects with a lot less to go on than this, but as I get older, it seems much better to get an initial design down on paper first.

Of course, when you get down to the coding, you inevitably hit on flaws in the design, hopefully only minor issues of detail. They certainly should be, if you have thought things through properly. In this case, I made minor revisions of the design document as problems arose, making sure that it mirrored the state of the code. This may sound like heresy: surely the design should be fixed and the code written to fit its specifications. Well, realism has to creep in somewhere: the first implementation of a program is a perfectly valid part of the design process. I felt that I had gone as far as I could with the paper design and needed to actually code something. Of course, having a development team of one is a distinct advantage here: with larger group efforts, writing code to agreed specifications becomes a more acute issue.

Initially, the project was to consist of three programs written in ANSI C, all running on Unix systems. First of all, there's a server process running on the HSM to control and log the activities of clients. The clients, which do all the actual work, run on many other systems, on top of various Unix flavours. Finally, a control program provides a means for users on any machine to interrogate the server. Additionally, there are some commands that can be sent from a suitably validated client to change the server's activities, for example to force it to reload configuration information.

This split of work is common in networked systems. Think of a networked print spooling system, for example: there is a server to manage the printer, client programs that submit jobs to the queue, and a utility for interrogating the queue to find where print jobs are lurking.

## Getting started

I usually start a large programming project by dealing with error handling and memory management issues. It is generally prudent to place the necessary code in a library shared by all the programs in a suite. At the very least, this ensures that team projects don't suffer from the same primitives being rewritten several times in different ways with different APIs by different people. Secondly, it means that all the programs use the same high-level API for achieving exactly the same objective, so the suite code is more consistent and readable as a unit.

I always start a common library off by writing an error handling module, usually called **error.c**. It will contain two routines:

```
void error(char * fmt, ...);
void fatal(char * fmt, ...);
```

The **error** routine is used to signal non-terminal program errors, while **fatal** is called when the program has to throw in the towel and die. The routines take **printf** style arguments to allow for flexible error reporting.

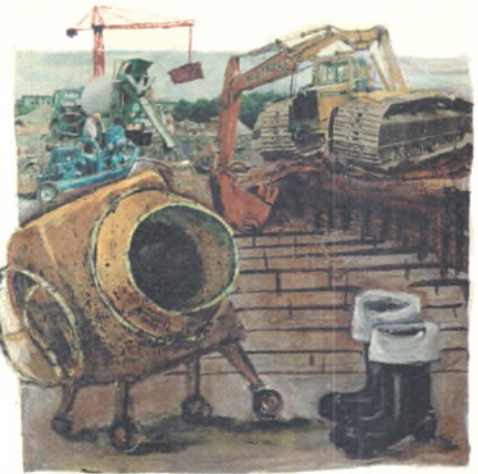
Having specific routines for signalling error conditions has a number of advantages. Firstly, it makes code that calls them much more readable: when someone looking at the library or a program sees a call to **error**, they know exactly what the intention is. Secondly, placing all of a program's error handling in one place makes it a sim-

**The first implementation of a program is a perfectly valid part of the design process**

ple matter to, say, divert error messages to a file or add special formatting to error reports. And lastly, you know how other routines handle errors, ie where the messages will eventually end up.

As time has gone on, I've changed the way that I allow for tailoring of the error routines. For example, it's common to want to print the program name as part of error messages, and since the library will be used by several programs, the string has to be gotten from somewhere. In the past, I would use a global string initialised in a program's main function.

Nowadays, I engage in strict data hiding to control the global namespace, and only allow access to data within separate program modules via access routines. I have undergone no religious conversion to adopt this policy: it derives from bitter experience. I've just been bitten too many times by the pollution of programs' global namespaces. In **error.c**, the program's name is set by a function called **set\_error\_name** or **SetErrorName**



(depending on my current naming whim), which stores it in a static vector for use by the **error** and **fatal** routines.

If more complex tailoring is required, it is still possible to avoid global data by implementing a callback mechanism in the error routines. These routines can call a previously registered application-specific routine prior to printing the generic error message. For example, the server in this system logs each of its errors to a file, along with a timestamp.

## Memory management

The next module to be dealt with handles memory management issues. The programs I write tend to obtain most of their working memory from the heap rather than relying on statically allocated space. Of course, allocating memory from the heap is not guaranteed to work. Although it is likely to be a rare occurrence on most modern systems, sooner or later a memory request will fail and return a **NULL** pointer. When heap memory is exhausted, the **NULL** pointer actually indicates that there's a problem with the system itself: it's running out of swapping space.

It's unclear what can be done in this situation if your programs depends on the memory's availability – in many cases, all you can do is call the **fatal** routine and hope the 'No more memory' message is of some help. Because of this, I prefer to keep the code that tests for a **NULL** return hidden away from the main code. It's a bore to continually have to write:

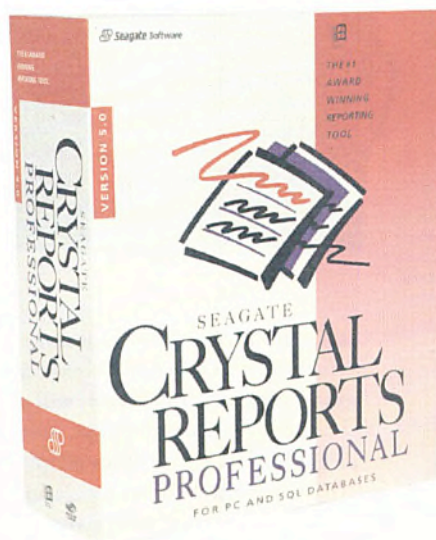
```
ptr = malloc(SIZE);
if (ptr == NULL)
    fatal("Out of memory\n");
```

So my module **mem.c** mirrors **malloc**, **calloc**, **realloc** and **strdup** with **Malloc**, **Calloc**, **Realloc** and **Strdup**. These routines are all about three lines long, and simply call the 'real' routines, invoking



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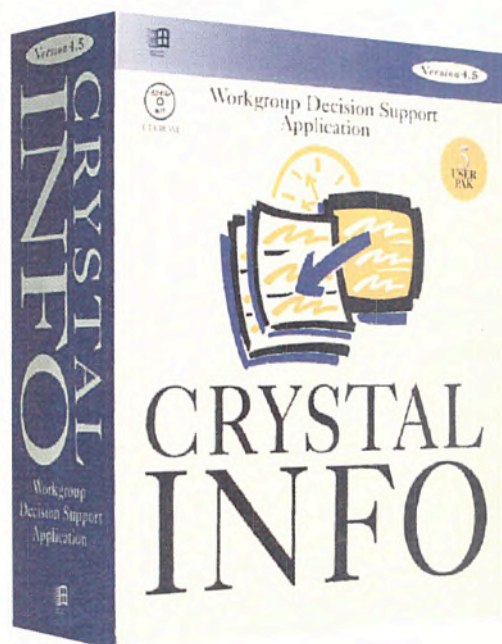
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**fatal** if a **NULL** pointer is returned. I also throw in a routine called:

```
char * Strcat (char * old,
              char * append);
```

This routine adds the **append** string to the end of the **old** string, frees the space occupied by **old** and returns a pointer to the composite string. Together, the two primitive functions **Strdup** and **Strcat** are usually sufficient to cover all heap text string management.

For some applications, I will add a routine that will use the **mmap** system call to connect to a file in memory and free the memory again after use. The technique can save some awkward string processing in some applications, since you can use the strings in the file *in-situ* by placing zeroed bytes at appropriate places in memory, having made sure that these nulls will not be written back to the file. I talked about this technique in my column 'Memory' that appeared in *.EXE* in March 1992.

This is all not terribly earth shattering stuff, but the memory management layer allows the creation of considerably simplified code which is easier to write, read and maintain.

## Data structures

Having written (or adapted) some of the primitive routines I will need, I turn my attention to the data storage requirements of the suite. The library may need some routines that handle such things as tables, lists or trees. In general, I prefer to pick a single type of structure sufficiently flexible to handle all my requirements and use it everywhere, rather than going mad with too many different ones.

The actual data structures that I use obviously depend on the application. For example, if the programs read stored data sets that are never changed throughout their lifetime, it's convenient to use dynamically created linear vectors of structures. These can be managed using a simple API, starting with a routine to append new values. This routine will recognise when it is invoked on an empty vector, and will allocate a chunk of memory to hold a number of structures. Subsequent additions will use up the space in this chunk until it is full, whereupon the append routine will call **Realloc** to gain more free space.

The use of **Realloc** can result in the actual vector contents being shifted around in memory, making it unwise to store any pointers to elements within the vector if regular additions are being made. As I said, this structure is best suited to data that does not change throughout the lifetime of

the program, since coping with regular additions, insertions and deletions can complicate the various updating routines considerably. The contiguous vector of structures we end up with can be readily searched linearly.

If a program's data will change regularly, a more flexible data structure is needed. I favour singly linked lists, largely because you can create most other data structures from them. Restricting the linkage to a single pointer does complicate some of the primitive operations, but it requires you to store only a pointer to the head of the list.

In this particular application, a list is defined as:

```
typedef struct list {
    struct list * next;
    char * name;
} List;
```

The end of the list is indicated by a **NULL** pointer in the **next** field. In keeping with the principle of data abstraction, the actual

**I've just been bitten  
too many times by  
the pollution of  
programs' global  
namespaces**

**List** structure is local to the library routines, and is accessed only through the library primitives. In fact, the primitives are mostly passed other structures that start with these two variables. For example, my structure used for processing a file system is:

```
typedef struct node {
    struct node * next;
    char * name;
    int mode;
    struct node * dir;
} Node;
```

The **name** field holds the name of a file in the tree. The **mode** integer stores its file mode (obtained from the file system). If it is a directory, the **dir** pointer is used to point to a linked list of the files it contains. I could have explicitly defined a **List** element at



the start of the node structure, but I am reluctant to add to the verbiage in the program. After all, **np->name** will compile to the same code as **np->list.name**, and is easier to type. Keep things simple.

The primitive list manipulation routines deal happily and safely with the **Node** structure, but the calling code can become untidy, since C wants **Node** structures passed as parameters to be explicitly cast into **List** structures. I tend to get round this by defining structure-specific one line interface routines like:

```
Node *
del_node(Node * base, Node * del)
{
    return (Node *)del_list((List *)base,
                           (List *)del);
}
```

The other key to painless list manipulation is to properly deal with special cases when the pointer to the head of the list will change. Let's say we are deleting nodes from the sublist hanging off a **dir** pointer within a **Node**. Ideally, we don't want to have to continually worry about the special case of deleting the first element, when the **dir** pointer must be changed. To handle this elegantly, we simply make the list primitives always return a pointer to the start of the list. We can then say:

```
np->dir = del_node(np->dir, del);
```

In the special case that **del** points to the first element of the list, we simply return its **next** pointer and free the memory it occupies. Otherwise, we zoom down the chain of elements looking for the one that points to **del**, update its next field to point to the element after **del**, free the memory and return the original pointer to the first element in the list.

There is another point to note: I find that in my applications, it's common to



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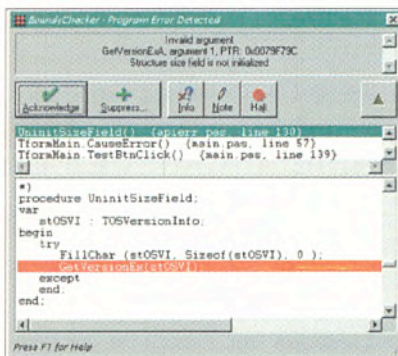
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want to use lists to store name and value pairs. Allowing the list routines to see the **name** field which is normally used to hold access keys for the data enables me to place key-based searching operations within the shared library, making them available to all programs.

## I engage in strict data hiding to control the global namespace

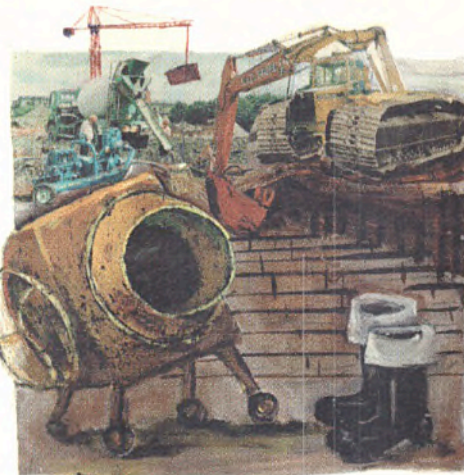
### The main event

With the primitive routines in place, it's time to start thinking about the main code of the applications. I tend to split each application into several modules accessed by globally visible function calls, with the rest of the routines in the module declared **static**. Any data the module requires is

passed into the code through function parameters, and any results are passed out as return values. The ideal is to reduce the module's outside appearance to a single self-contained routine with no global data at all. If this is achieved, the module can be picked up and used in other programs without any of the problems that require messy **#ifdef** statements to fix. To take some examples from the project, the module used by the server to process its configuration data is also used (with an interface routine) by the control program when querying the data. Similarly, the client module that handles the client's end of my network protocol is reused in the control program.

Of course, in reality there will always be some global data. I try to limit this to only the most important main data structures, and any constants needed by the program.

It is usually beneficial from a maintenance perspective to place constant definitions within a separate file, be that a header file of **#define** statements or a C file that holds the necessary values and defines the namespace they sit in. In actual fact, I rarely use **#define** for constants, since there is scope for mistakes in their use, and you usually have to create a variable to hold the appropriate data anyway.



In this project, the constant definitions reside in **constants.c**, which has actually migrated to the library, meaning all the programs in the suite get them whether they need them or not. This prevents problems with using the same name for different constants in different programs, and makes configuring the program suite easy: change a single file, recompile the programs and you're done.

I isolate all the Unix specific interface code into the file that contains the **main** routine. It's obviously sensible to place the

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routine that decodes the program arguments in that file, but I also include all the code for handling signals, setting up terminals, and so forth.

My typical **main** routine first decodes the program arguments, executes any program initialisation, and finally calls a routine called **process** or **doit** to actually perform the main task. This follows one of the great maxims in programming: sepa-

**I prefer to pick a single type of structure and use it everywhere**

rate the control of actions from the actions themselves. Most programs consist of a set of routines that perform some task on many similar sets of data, generally with **for** or **while** loops enclosing some code that performs the task on an individual set of data. Unless the whole loop only consists of a few

lines of code, I always write an action routine to do the task on one data set, and then call it from inside the loop. This clearly separates the messy code to do the task from the equally messy code controlling how the task is to be done. As a result, my code breaks down into a great many small routines, each with a well defined interface, its own namespace and access to local data. Each individual function is easy to debug because it's small, and the code is easy to understand because it's broken into easily digestible chunks. Separating action and control code makes debugging easier, since you don't need to understand every line of code in the program, and you can fix it using a need-to-know principle. It is also easier to identify shared primitives that are candidates for moving into the library, and migrating them is straightforward, since they are already defined as routines.

## KISS

What can you draw from all this? Well, here are some truisms to be going on with. Design before you code. Top-down program design succeeds when you have the correct primitives in place. Use a library to create basic primitives. Data abstraction and hiding in C is perfectly possible and you should

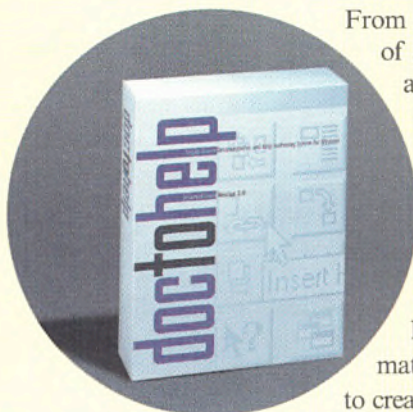


use it (Francis Glassborow made this point in his August *EXE* column). Split your programs into logical modules. Don't overcomplicate names and structures in C. Brief code makes for easy comprehension. Oh, and keep it simple, stupid.

*Peter Collinson is a freelance consultant specialising in Unix. He can be reached electronically as pc@hillside.co.uk, by phone on 01227 761824 or on the Web at <http://www.hillside.co.uk>.*

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# Carving up bugs

**S**licing algorithms enable programmers to extract the parts of a program that affect a chosen set of variables at some chosen point, forming a slice. Slices can be very useful in understanding and debugging code, since they comprise only those parts of a program related to a specific sub-computation (defined by the *slicing criterion*), while retaining the effect of the original code. In general, slices are constructed for a set of variables, but in this article we shall simply consider slices constructed for a single variable. I'll describe several ways in which dynamic information about the execution pattern of a program can be used to produce simpler slices than are possible using the static approach (described in detail in last month's issue of *EXE*).

## Static slicing

In what has come to be termed 'static' slicing, the slicing criterion contains no information about the execution of the program, and so the slice preserves the effect of the code for every possible execution pattern.

Consider the example in Listing 1. The program is supposed to calculate the sum and product of the sequence of numbers from 1 to the input number *n*, but the value of the product *p* is always found to be zero. In order to locate the cause of this errant behaviour, we can construct a static slice for the variable *p* at the end of the program, as shown in Listing 2. Since the slice is simpler than the original program, it is easier to locate the bug (in this case, *p* should be initialised to 1, instead of 0).

Although static slicing can undoubtedly assist in the debugging effort, it does tend to produce rather large slices. This is particularly true for well-constructed programs, which are typically highly cohesive, resulting in code where the computation of each variable is highly dependent upon the values of many other variables. Indeed, this observation about the relationship between the size of a typical slice and the cohesiveness of a program has led to work on cohesion metrics based upon slicing, which I will cover in a forthcoming article.

## Dynamic slicing

When it comes to debugging a program, we will usually have executed it at least once, and found it to produce unexpected results. For example, the program in Listing 1 might have been passed an input value 0 for the variable *n* – this is in fact a highly likely choice, as one tends to test loops with 'special case' values. Now, when we execute the program, we will find that the variable *p* contains the wrong value.

Instead of consulting a static slice to locate the bug, it would make more sense to construct a slice which exploits the specific information available about the input which caused the code to break. Such a slice is called a *dynamic slice*, since it is constructed with respect to the traditional slicing criterion *together* with information on a particular execution pattern, to wit: the sequence of input values passed to the program. Collectively, this information is referred to as the 'dynamic slicing criterion'. We shall say that we construct a dynamic slice for a variable *v*, at a point *p*, on an input *i*. To describe the input sequence *i*, we shall enclose the sequence of values in angled brackets.

A dynamic slice of the code in Listing 1 constructed for *p* at the end of the program on the input sequence <0> is shown in Listing 3. It is far simpler than the corresponding static slice (Listing 2), and clearly highlights the bug in the original program!

Slicing is an automated technique for program simplification, which can aid debugging and maintenance.

**Mark Harman** explains how execution information can focus the spotlight even closer...





Obviously, we were rather lucky in this case, achieving the maximum level of simplification possible. In practice the slices constructed will be more complex. However, in cases where a variety of test data causes some error, there is nothing to stop us having the slicing tool construct a dynamic slice for each set of input, and present us with the smallest.

## Slicing precision

There are two main properties desirable in slicing algorithms, which we call *soundness* and *completeness*. In order to be *sound* an algorithm must never delete a statement from the original program which could have an effect upon the slicing criterion. It is this property that allows us to analyse a slice in total confidence that it contains all the statements relevant to the criterion. Soundness on its own, however, is not enough: a trivial slicing algorithm could refuse to delete *any* statements from a program, thereby achieving soundness by doing nothing.

In order to be *complete* a slicing algorithm must remove all statements which cannot effect the slicing criterion. In general, completeness is unachievable (for theoretical reasons to do with undecidability). Therefore, the goal of slicing algorithms is to delete as many statements as possible, without giving up soundness. The closer an algorithm approximates completeness, the more precise the slices it constructs will be. It has been proven that a dynamic slice constructed for some variables at a certain point will always be at least as thin as the corresponding static slice, and in practice we find that dynamic slices are often a great deal simpler. This makes the technique ideally suited to debugging, when we want to focus on the statements that could have caused errors in a particular execution.

## Constructing dynamic slices

One way to construct a sound dynamic slice is simply to trace the execution of the program for the input we are interested in and then to remove from the corresponding static slice those statements which were not actually executed. This is a nice, simple algorithm and it is obviously sound, because an unexecuted statement cannot affect the slicing criterion. However, this simplistic approach does not construct the most precise dynamic slices. To see why, consider the example program in Listing 4. This is not meant to be a realistic program: rather it serves to illustrate the subtlety of dynamic program dependencies.



Suppose the input supplied to the program is  $\langle 2, -2, 4, -4, 6 \rangle$  and that we are interested in the effect the program has upon the variable  $y$ . Notice that the static slice for this program, constructed for the variable  $y$  at the last line, is the entire program – no lines may be deleted. Also notice that for this input sequence, *all* the lines of the original program are executed, so our simplistic algorithm would generate a dynamic slice consisting of the whole program, far from ideal.

However, a more precise slice that can be constructed from this criterion is shown in Listing 5. We do not need to include the line  $y=x+2$ ; because this line does not contribute to the final value of  $y$  when the last input entered is greater than zero. In order to construct slices like this, we need to perform more sophisticated analysis of the way in which dependencies between parts of a program change as the execution progresses.

## Is dynamic slicing always better?

We have seen that dynamic slicing is very attractive as an aid to debugging, and indeed superior to static slicing for that purpose, and the reader would be forgiven for concluding that static slicing is thus obsolete. However, we *do* still require static slicing for situations where slices have to be sound for every possible execution pattern.

For example, suppose we are interested in reusing the part of a program which implements a particularly efficient and well-tested approach to some problem. Often, in such situations (particularly with legacy code), the code we want to reuse will be intermingled with all sorts of other unrelated code. In this situation static slicing is ideal as a technique for extracting the part of the program we require, while leaving behind the code we are not interested in.

The static and dynamic paradigms represent two extremes – either we say *nothing* about the execution characteristics of the program (and cater for every possible execution pattern) or we say *everything* (and cater only for a single input). Recent developments have produced a variety of compromise approaches to slicing, which occupy the space in between.

These approaches are called ‘quasi-static’ – although they might equally be called ‘quasi-dynamic’, as they lie somewhere between the two poles. The aim of these paradigms is to enable programmers to specify some information about a program’s execution, without having to provide all of it. They are most applicable to the area of program comprehension.

## A free dynamic slicer

Sophisticated dynamic slicing of the type described in the article is provided by the freely available slicing tool *Spyder*, created by Hiralal Agrawal, Richard DeMillo, Hsin Pan, Eugene Spafford and Chonchanok Viravan at Purdue University. The team has (very kindly) made the tool available for downloading at: <http://www.cs.purdue.edu/homes/spaf/spyder.html>.

## The history of slicing

Program slicing was introduced by Mark Weiser in his seminal 1979 PhD thesis, and this work was extensively developed by Keith Gallagher, Jim Lyle, Susan Horwitz and Thomas Reps among others. Dynamic slicing was introduced by Bogdan Korel and Janusz Laski in 1988 and was further developed by the Spyder research team at Purdue University and Mariam Kamkar, Nahid Shahmehri and Peter Fritzson at Linköping University. Quasi-static approaches to slicing were first suggested by G. A. Venkatesh in 1991, and have been extensively developed by Frank Tip, John Field, Andrea DeLucia, Malcolm Munro, Aniello Cimitile, Geraldo Canfora, Gregor Snelting and other researchers at the Universities of Durham, Bari, Benevento, Naples and Brunswick and at the Thomas Watson Research Centre.

Many other research workers, sadly too many to mention by name, have also been involved in the development of slicing. Jens Krinke provides an excellent web page which is a treasure trove of links to slicing research work and freely available slicing tools. The URL is: <http://www.cs.tu-bs.de/~krinke/Slicing/slicing.html>.



## Partial input information

When trying to understand the behaviour of a program, we may sometimes not want to specify the *entire* input sequence. Often, we can significantly improve the simplification power of the slicing tool by providing just the





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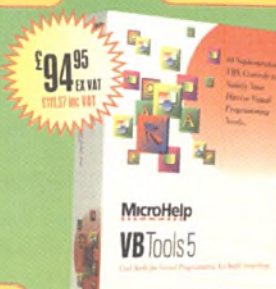
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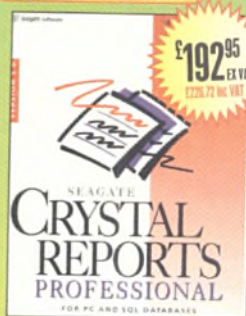
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```
scanf("%d",&n);
s=0;
p=0;
while (n>1)
{
    s=s+n;
    p=p*n;
    n=n-1;
}
printf("%d",p); }
/* the slice point is the end of
the program */
```

Listing 1 – A program fragment to be statically sliced.

```
scanf("%d",&n);
p=0;
while (n>1)
{
    p=p*n;
    n=n-1;
}
```

Listing 2 – A static slice of Listing 1.

```
p=0;
```

Listing 3 – A dynamic slice of Listing 1.

```
for(i=1;i<=5;i++)
{
    scanf("%d",&x);
    if (x>0)
        y = x+1;
    else
        y = x+2;
}
```

Listing 4 – The subtlety of dynamic information.

```
for(i=1;i<=5;i++)
{
    scanf("%d",&x);
    if (x>0)
        y = x+1;
}
```

Listing 5 – A more precise dynamic slice of Listing 4.

```
scanf("%d",&x);
scanf("%d",&y);
if (x>=0)
    p = x*y;
else
    p = y*y;
printf("%d",p);
```

Listing 6 – Input prefix example.

```
scanf("%d",&x);
scanf("%d",&y);
if (x>y)
    z = 1;
else
    z = 2;
printf("%d",z);
```

Listing 7 – Conditioned slice example.

first part of an input sequence. For example, consider the program fragment in Listing 6. If we know that the first element of the input sequence is 4 then, without any further information, we know that the assignment  $p = y * y$ ; will not be executed, and can thus be excluded from any slice.

By specifying only a prefix of the input, we move away from dynamic slicing towards static slicing: a whole set of execution patterns is captured by the slice, rather than just a single execution. Knowing for instance, that the statement  $p = y * y$ ; is not executed if the input starts with 4 captures the information contained in a set of dynamic slices, for which the input sequence takes the form  $\langle 4, x \rangle$  for some  $x$ .

## Conditioned slicing

There are often situations where we shall want still more flexibility in specifying the conditions in which the program is executed. For example, consider the program fragment in Listing 7. In order to achieve any extra simplification from this program, we shall have to provide information about *both* inputs to the program, so specifying only part of the input will not help.

Fortunately, we can provide information to the slicing tool about the input without being so specific as to give the precise values. We can use a boolean expression, for example  $x==y+4$ , to relate the possible values of the two inputs  $x$  and  $y$ . When the program is executed in a state which satisfies this condition, we know that the assignment  $z = 2$ ; will not be executed. Any slice constructed with respect to this condition may therefore omit that statement. This approach to slicing is called the *conditioned* approach, because the slice is conditioned by knowledge about the situation in which the program is to be executed. Furthermore, we could use a similar approach for code like that in Listing 6: instead of providing an initial prefix of 4, we could specify  $x==4$ . It is in fact possible to replicate anything that could be achieved with the partial input approach using conditionals.

Conditioned slicing addresses just the kind of problems maintainers face when presented with the task of understanding large legacy systems. Often, in this situation, we find ourselves asking questions like 'suppose we know that  $x$  is greater than  $y$  and that  $z$  is equal to 4,

then which statements would affect  $v$  at line 38?' Conditioned slicing can provide an answer automatically: you simply construct a slice for  $v$ , at 38, on  $x>y \ \&\& \ z==4$ . By building up a collage of conditioned slices which isolate different aspects of the program's behaviour, you can quickly obtain a picture of how the program behaves under various conditions. The approach is really nothing more than a tool-assisted form of divide and conquer.

Program slices can be constructed in numerous ways, with entirely static information or either partial or full information about program execution. There are trade-offs between the precision of a slice and the time needed to compute it, and between how specific we are about possible execution patterns and how simple our slices will be. Fortunately, the recent developments in slicing will allow us greater freedom to choose how we want to balance the various considerations involved. ■

Mark Harman is director of research at the School of Computing University of North London, where he teaches programming in C++ and formal methods in Z. Dr. Harman, his colleagues and students have been working on slicing for the past three years, concentrating on new algorithms and approaches to slicing.

He can be contacted via email at [m.harman@unl.ac.uk](mailto:m.harman@unl.ac.uk).

Dr. Harman's Web page at <http://www.unl.ac.uk/~mark/welcome.html> contains some of his team's other publications on slicing and pointers to the work in this area.







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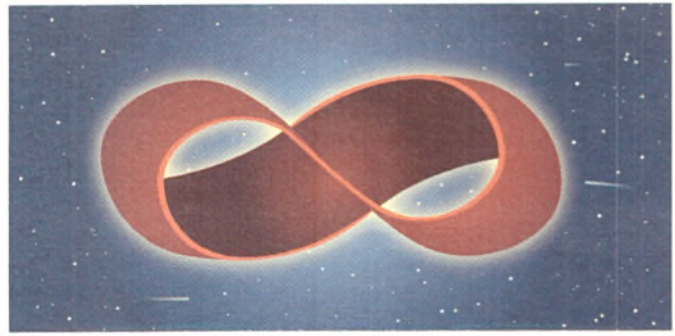
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## Managing Change With Integrity



# Tenuous link

C++'s **extern** qualifications have evolved far beyond their original purpose, breeding into countless fertile application areas. **Francis Glassborow** searches for the missing link.



When C++ first escaped from AT&T the only way to compile source code was via Cfront, a translator which converted C++ source code into C for compilation by a platform's native C compiler. In that environment, **extern "C"** specifications made perfect sense: they meant literally 'do not translate this, it is already C.' The concept was very like using the **asm** keyword to mark a section of source as assembly code for the underlying machine.

As the language matured, native C++ compilers began to appear (I believe that Zortech – or Zorland as it was then called – was the first), and it became necessary to define **extern "C"** in more general terms. Probably because the semantics remained trivial on most platforms, insufficient care was taken with the specification, the result being that the rule simply said that names declared as **extern "C"** were C names with C linkage. On most systems this merely meant that function names would not be mangled to support overloading, but there was a strong implication that there existed some unique set of rules for C names and linkage. A little thought will tell you that this is not the case – if such a set of rules did exist we would not have problems linking our C code to libraries built with a different compiler. C implementations are fully entitled to provide mangled linkage names (and at least one does). There is also the issue of parameter passing: there is no universal mechanism for passing an argument list to a parameter list in C.

As C++ developed further, the concept of external linkage came into use as a generalised mechanism for inter-language linkage. Those writing for platforms such as Windows and X needed the facility for dispatching callback functions from their programs, and programmers also recognised the potential for using function libraries written in other languages like Fortran. The **extern** specification has come to be used both for linking external functions to C++, and for making a C++ function available in other languages. Every group of programmers has had to find ways of fixing their particular problems with doing this, but most do not realise how limited these fixes are. For example, the oft-quoted technique of using static member functions to serve as callbacks has nothing to do with external linkage – the reason an ordinary member function cannot be used is because such functions take an implicit extra reference argument (a reference to the object the method is being invoked on).

As time has passed, those responsible for defining C++ have increasingly resorted to pointing out that the C++ linkage specification relates only to writing C++, and has nothing to do with the outside world. Accordingly, marked source code is to be compiled as C++ and only the name and (possibly) calling conventions are affected.

If we pursue this line of thinking, we inevitably arrive at the conclusion that we should either abandon external linkage specifications or make their definition more complete. To do the latter, we have to consider cases such as:

```
extern "C" qsort(void *, size_t, size_t,
               int (*)(const void *, const void *));
```

Is the last parameter a pointer to a C or a C++ function? Until the last meeting of X3J16 in Stockholm, the answer was that there was no such thing as a C++ pointer to a C function, because C++ only supported its own function types. The **extern "C"** qualification only affected linkage and had nothing to do with type. The reason that Standard C Library functions worked in C++ was that language implementors provided C++ versions of the library, and worked hard to shield developers from problems.

At Stockholm we decided that a function's external linkage specification should be part of its type, in exactly the same way as its return type is. Thus, you cannot overload a function solely on the basis of different external linkage, for example: **extern "C" void fn ();** and **void fn ();** cannot coexist any more than **void fn ();** and **int fn ();** can. However,

```
extern "C" void fn(void (*));
void fn(void (*));
```

will be allowed in future because the **extern "C"** qualification will apply to all functions and function pointers within the declaration. The result of this is that the first function takes a pointer to a C function which takes no parameters and returns void, whereas the second takes a pointer to a C++ function. This is analogous to overloading a function on the return type of a function pointer parameter:

```
void fn(int (*));
void fn(void (*));
```

The next issue is how to write an **extern "C"** qualified function that takes a pointer to a C++ function as a parameter. This can be achieved by using a **typedef**, like:

```
typedef void (cfunc());
// cfunc is a C++ function with
// no parameters, returning void
extern "C" void fn(cfunc*);
```

Judicious combination of **typedefs** and **extern "C"** specifications will handle all reasonable requirements. The change will not affect most C++ programmers but I believe that it improves the versatility of the language.

It will be left to compiler writers to specify exactly how **extern "C"** modifies linkage, naming and calling conventions, and they could take the opportunity to implement beneficial extensions. For example, Borland could provide an **extern** linkage specification that would allow Borland-compiled source to link to object code generated by a Microsoft compiler. I expect that many compilers will also support trivial conversion between C and C++ function pointers, retaining conformance by issuing a diagnostic.

That is the last of the substantial items from the Stockholm meeting that I promised to report on.



## Design and C++

*Large-Scale C++ Software Design* (John Lakos, ISBN 0-201-63362-0) is one of those books that should be read by all serious C++ programmers. Though the author is ostensibly addressing those responsible for projects that run into hundreds of thousands of lines of code, what he has to say deserves to be considered by a much wider audience. It is in the nature of things that programmers start with small projects and mature into building larger ones – and those who have acquired good habits from the start won't have to radically change their style.

The author has a wealth of experience derived from his employment with Mentor Graphics. They were one of the first companies to adopt C++ (back in 1985) and had to learn many lessons the hard way.

There are quite a few books on C++ design, but what sets this one apart is the focus on practical advice on both physical design and logical design. It is lack of consideration of physical design that results in unacceptable build times for large projects, and yet the subject is rarely covered in texts. Overall, while I do not agree with everything the author says, it would be a rare development team that did not benefit from studying this book.

Just after I had submitted my column for last month a CD, *C++ Report 91-95*, landed on my desk from SIGS, the publishers of *C++ Report*. For many developers, the major barrier to subscribing to that excellent journal has been the cost: more than double that of this publication. Another problem is, for many C++ programmers, much of the material in any one issue will be beyond their level of expertise. The CD contains five years' worth of *C++ Report* for just £60, and having it in electronic form means that it's easy to find material that is still relevant to your work and within your level of understanding.

## Java developments

I do not know of any previous case where a new computer language has spawned development environments and tools with anything like the speed that Java has.

Microsoft has pulled out all the stops to produce Visual J++, a development package as good as any of its packages for other languages (see review on page 59). Microsoft shares my view that Java is just another (potentially excellent) programming language. From a market point of view, grabbing Java and encouraging programmers to use it for developing such things as ActiveX components is an excellent response to any perceived threat that the Java virtual machine poses to Microsoft's operating systems. The fact that such elements will lack the security and portability that Java promises is beside the point.

On another front, ParcPlace, a Smalltalk specialist, has just released Parts for Java. It has capitalised on its Smalltalk experience to develop an excellent set of visual programming tools for Java, certainly worth looking for applet/application development.

## Last month's problem

Last time I asked you to consider the problem of providing a function with static data on a thread by thread basis, in other words, how to support the persistence idiom in a multi-threaded environment. Here is how non-thread code would look:

```
void persist(void) {
    static int last_use = 0;
    /* code that uses the value of some
       data from the previous call */
    last_use = <new value>;
    return;
};
```

I don't intend to give you a complete solution since that would obviously depend on the exact circumstances. However there is an important technique available in C++ that deserves to be more widely understood. Look at the following class definition:

```
class Persist {
    int last_use;
    //inhibit copying
    Persist(const Persist &);
    void operator = (const Persist &);
public:
    Persist() : last_use(0) {}
    void operator () () {
        /* code that uses the value of some
           data from the previous call */
        last_use = <new value>;
        return;
    }
};
```

Now, `Persist persistent1;` creates an object that can be used as if it were a simple function, as in: `persistent1();`

Note: I have put the definition of `operator ()` in the interface of the class for convenience only, in real life it would of course be in the implementation file for `Persist`. Each thread will create its own named `Persist` function object, with the same function body but their own instance of `last_use`. I strongly recommend that C++ programmers learn about function objects, since they have many uses, some of which are highlighted by the Standard Template Library.

## This month's problem

Look at the following code, assuming that all necessary header files have been included and then comment on the errors that you find.

*File1.c*

```
char buffer[SIZE]; //SIZE provided in an included header file
/* other C code */
```

*File2.c*

```
extern char * buffer;
void capitals () {
    int i;
    for (i=0; i<SIZE; i++)
        if (buffer[i] >= 'a' & buffer[i] <= 'z')
            buffer[i] -= 32;
    return;
}
```

## ACCU conference news latest

It looks as if our planned training day on July 18th 1997 (to precede our Conference on Saturday 19th) is growing to be something more substantial. Bjarne Stroustrup, who has already agreed to speak on Saturday, has asked for a second slot to talk to specialist C++ programmers, which we shall probably put on Friday. ■

ACCU subscriptions: individual £15, student £7.50, corporate £80, Overload & C++ SIG £15 (+ACCU membership). For further information about ACCU write to Francis Glassborow, 64 Southfield Road, Oxford, OX4 1PA, ring 01865 246490 or email [francis@robinson.demon.co.uk](mailto:francis@robinson.demon.co.uk).

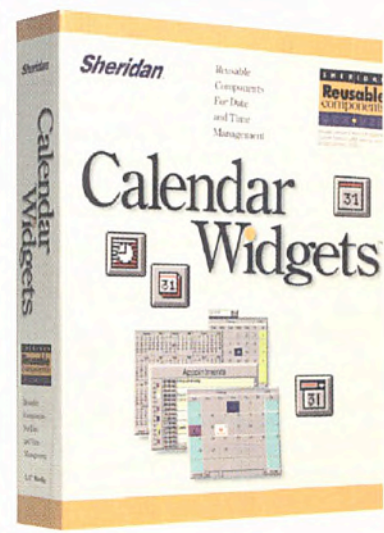
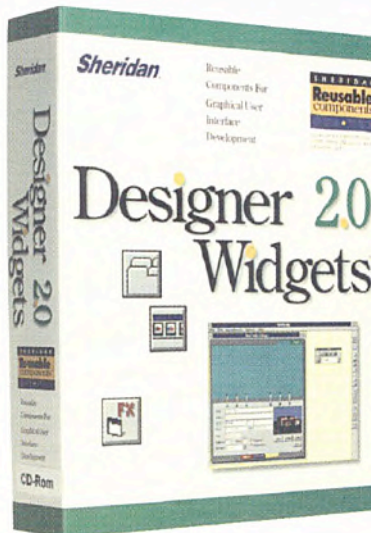
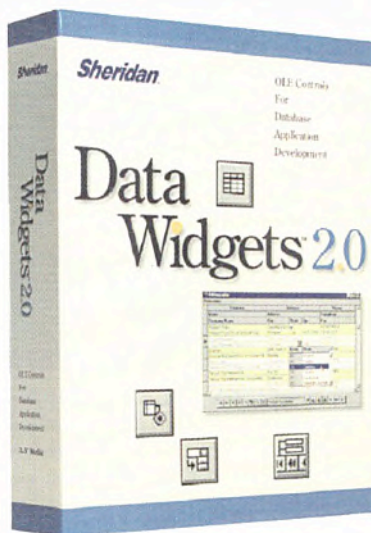


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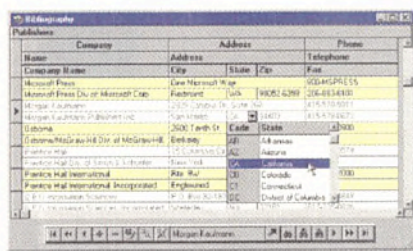
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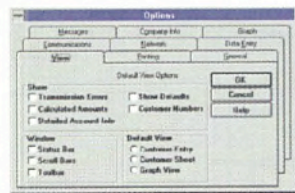
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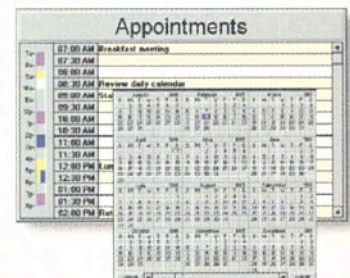
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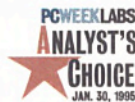
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# Essential Scripting



In recent years, the shortage of network bandwidth has begun to provoke many client/server systems to move away from the traditional supplier-consumer architecture towards increased client-side intelligence. The combination of scripting languages, HTML and object technologies can bring this functionality to web-based systems, enabling developers to embed sophisticated applications within HTML pages.

There are several possible approaches to choose from: Java applets, ActiveX objects, scripts, combinations of scripts and applets, or of scripts and ActiveX... the list goes on. Each approach has its pros and cons with respect to convenience, overhead, security and so forth, and it is up to you the developer to decide which is best for any one particular application.

So when should you use scripting? Well, if you are acutely paranoid about other people seeing your code then you shouldn't use it at all: scripts can be viewed along with the HTML container code from within a browser by selecting the View Source menu option. However, with all the 'free' code available on the net, I'm not going to lose much sleep over giving away my scripts in this way.

Obviously, security critical functions should not be scripted: even Java applets and ActiveX controls are fairly vulnerable. Security issues, as I'm sure you know, are always complex topics, and sensitive data processing will be taking place on the server behind a firewall for the foreseeable future.

Microsoft and Netscape have been rushing to extend HTML with interactive scripting functionality. **Roy Tynan** compares VBScript and JavaScript, the two great white hopes of this emerging technology, and shows just what they can do.

However, scripting could be used to embed an intelligent form in a page to perform, say, loan repayment or currency exchange calculations, or to automatically update a weather forecast applet to reflect changing conditions. In addition, pages may contain scripts that run on the server, or on both server and client. For example, a script could be used to dynamically generate and format HTML content based upon a database of user preferences.

## The terrible two

If your application is suitable for scripting, there are two main languages (within the PC environment at least) to choose from: the JavaScript language developed by Netscape in conjunction with Sun, and Microsoft's Visual Basic Script (or VBScript).

JavaScript is a relatively easy to use cross-platform object scripting language designed for creating online applications in combination with Java and HTML. While Java is used by programmers to create individual objects and applets, JavaScript is intended for use by HTML authors for

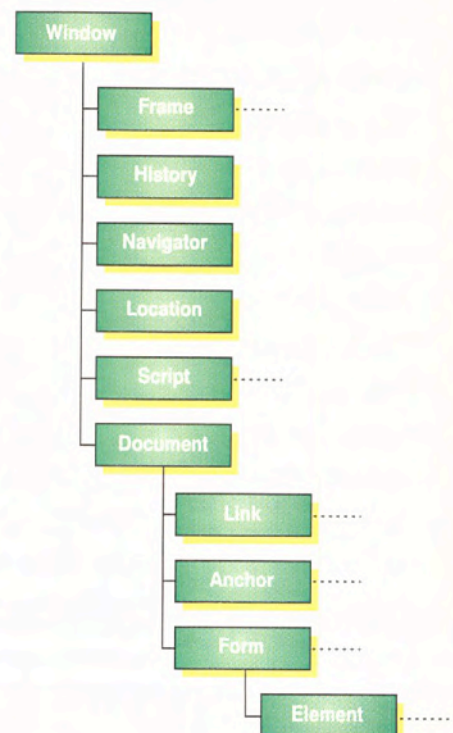
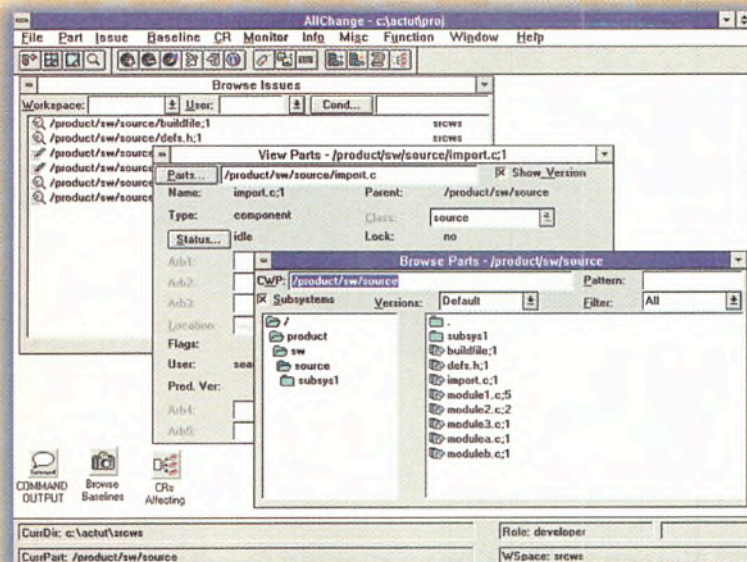


Figure 1 – The IE object hierarchy.



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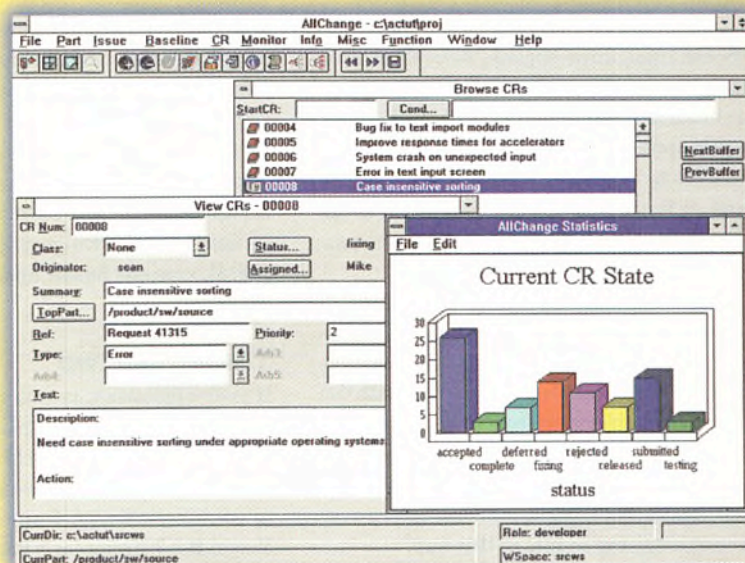
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dynamically scripting the behaviour of objects on both the client and the server. It is designed to be used even by those with little programming experience, but an understanding of object orientation concepts is essential to gain its full benefit.

VBScript is a lightweight version of Visual Basic 4.0, with features like file access, system executive calls and financial functions removed mainly for security. Unlike JavaScript, it is not object-based, and is probably best viewed as a 'glue' language for binding together and activating objects within HTML documents. Because of its origins, it is easy to learn, but it suffers from being based on Microsoft's non-cross platform Internet architecture – although this issue will probably be resolved fairly soon. Another point to note is that Internet Explorer (IE) is currently the only browser to directly support the language – Netscape requires a plug-in to run VB scripts.

## Essential HTML

Scripts are embedded directly into HTML pages using the `SCRIPT` tag, which marks sections of text as code to be interpreted. Listing 1 shows a basic HTML page with embedded script code to display two buttons which change their captions and display messages when clicked. Note that you can embed both scripting languages within the same document, although VBScript code will work with Netscape only if the VBScript plug-in has been installed.

After the standard HTML 'initialising' tags, the code defines and names a form to hold the two buttons, which are set up by the `<input type="button"...` lines. The first tag specifies an input button element referenced by the name `Button1`, and sets the `value` attribute to 'VB' (by default this is used as the button's caption). The `onClick` attribute associates a mouse click event for the button with a scripted routine, in this case the `b1()` VBScript routine defined further down the page. The function reference can be a URL for accessing code that resides elsewhere on the net. The next line of code defines a similar button which calls the JavaScript function `b2()`.

The actual VBScript code is contained within the `<script>...</script>` block, which indicates the scripting model via the `language` attribute. The script uses standard VB syntax, starting by declaring the `b1()` subroutine with the `sub` keyword, following on with a comment. The first actual line of code alters `Button1`'s `value` attribute (thus changing its caption) using the standard object hierarchy shown in Figure 1: `Button1` is an element contained within our form object `Form1`, which is itself contained within a document object. Object names are

```
<html>
<head>
<title>Demo Script</title>
</head>
<body>

<form name="Form1">
<input type="button" name="Button1" value="VB" onClick="b1( )" language="VBScript">
<input type="button" name="Button2" value="Java" onClick="b2( )"
language="JavaScript">
</form>

<!-- this is a HTML comment -->

<script language="VBScript"> sub b1( )
' this is a VBScript comment
document.Form1.Button1.value="VBScript"
alert "You have just pressed the VBScript button"
end sub
</script>

<script language="JavaScript"> function b2( ) {
// this is a JavaScript comment
document.Form1.Button2.value="JavaScript"
alert("You have just pressed the JavaScript button.")
}
</script>

</body>
</html>
```

Listing 1 – A minimal HTML and script page.



```
<html>
<title>Script Demo </title>
<body language=VBScript onLoad="Page_Initialise">
<!-- other HTML statements etc - >
</body>
<script language = "VBScript">
Option Explicit

'declare two "global" variables
Dim strMsgBoxTitle
Dim bValidOrder

Sub Page_Initialise
    strMsgBoxTitle = "Initialise a string"
    Call Another_SubRoutine
End Sub

Sub Another_SubRoutine
    bValidOrder = True
    Call Yet_Another_SubRoutine
End Sub

Sub Yet_Another_SubRoutine
    .....
    .....
</script>
</html>
```

Note: `onLoad` has a reciprocal function `onUnload`

Listing 2 – Script execution using the `onLoad` event.



separated by dots, the standard object association notation prevalent in most object oriented languages. The code then calls `alert` to display a popup message in the user's browser, and ends the subroutine. The script block is closed by the `</script>` tag. A tagged script block can contain as many subroutines as you like, and it is in fact possible to nest subroutines, just as in VB4. We'll consider this later when discussing how to handle runtime errors within scripts.

The JavaScript code is similar, but mirrors the Java/C++ syntax: routines are declared with the keyword `function`, are enclosed in braces, and use C and C++-style comments. The only actual change is that the argument passed to the `alert` function must be enclosed in brackets. There are a few significant differences between Java and JavaScript syntax: in JavaScript, variables are declared using the `var` keyword, and statements on separate lines are not required to be terminated with semicolons.

This example requires the user to trigger a button-click event in order to execute script code, but it is also possible to make scripts run automatically as soon as the page has been loaded. This is done by associating routines with the `onLoad` event, shown in the VBScript example in Listing 2, which associates the event with the `Page_Initialize` subroutine.

## Data types and objects

VBScript uses only one type for all variables: `variant`, which can hold data of any kind. It requires all variables to be declared before they are used, as with VB4's *Explicit* option.

JavaScript, on the other hand, does not use explicit data types: typing of data depends entirely on context. The interpreter evaluates expressions from left to right, and automatically converts all the operands into the type of the first. If you're not careful, this could trip you up: see Figure 2 for details.

Objects in JavaScript come in three flavours: browser objects (see Figure 1), standard JavaScript objects (such as the `Math` object), and user defined objects created within scripts. User objects are implemented using the keywords `this` and `new`, as in Listing 3. The first thing to notice is that object instances are constructed by a function named after the object type, in this case `car`. Within the function (and all other 'member functions'), the `this` keyword refers to the owner 'object' (as in C++), and we can refer to member variables with `this.variable-name`. The assignments using `this` within the constructor implicitly specify the object's member variables and functions. Object instances are created with the `new` keyword, which allocates the necessary memory and performs the necessary construction. The

```
function car (m, c, es, yb, nc) {
  this.model = m ;
  this.colour = c ;
  this.engine_size = es ;
  this.year_built = yb ;
  this.new_car = nc ;
  this.repayments = repayments ;
}

function repayments ( ) {
  if (this.model = "gti")
    return ("big monthly hire purchase payments") ;
  else
    return ("smaller monthly hire purchase payments") ;
}

var s ;
var myCar = new car ("gti", "red", 2000, "1996", true) ;
s = myCar.repayments ;
```

Listing 3 – JavaScript objects.

The following example defines a function, `myOnError`, that intercepts JavaScript errors. The function uses three arrays to store the message, URL, and line number for each error. When the user clicks the Display Error Report button, the display Errors function opens a window and creates an error report in that window. Note that the function returns `true` to suppress the standard JavaScript error dialog.

*Note: This example was tested using Netscape 3.0, it reports bugs differently than in IE.*

```
<html>
<body onload="noSuchFunctionExists()">
<form>
<br><input type="button" value="This button has a syntax error "
  onClick="alert('unterminated string')">

<p><input type="button" value="Display Error Report"
  onClick="displayErrors()">
</form>

<script language="JavaScript">
window.onerror = myOnErrorHandler

//initialise three arrays, notice we have to "new" them
msgArray = new Array()
urlArray = new Array()
lnoArray = new Array()

function myOnErrorHandler(msg, url, lno) {
  msgArray[msgArray.length] = msg
  urlArray[urlArray.length] = url
  lnoArray[lnoArray.length] = lno
  return true
}

//this function forms the error report, note the construction "on the fly"
//of an HTML page
function displayErrors() {
  win2=window.open('', 'window2', 'scrollbars=yes')
  win2.document.writeln('<b>Error Report</b><p>')

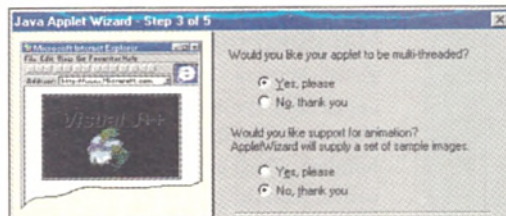
  for (var i=0; i < msgArray.length; i++) {
    win2.document.writeln('<b>Error in file:</b> ' + urlArray[i] + '<br>')
    win2.document.writeln('<b>Line number:</b> ' + lnoArray[i] + '<br>')
    win2.document.writeln('<b>Message:</b> ' + msgArray[i] + '<p>')
  }
  win2.document.close()
}
</script>
</html>
```

Listing 4 – JavaScript error handling function.

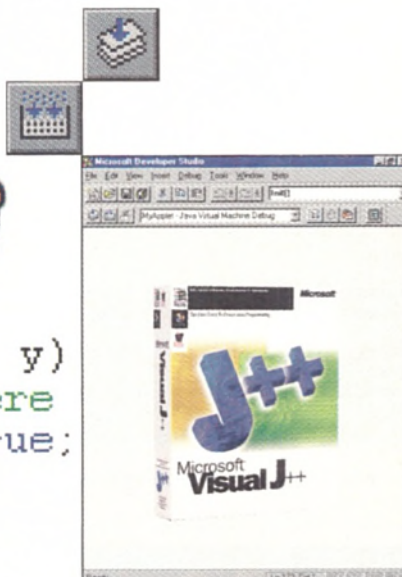


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```
int y)
Down code here
m_timeSet = true;
return t
m_timeSet = true
```



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Errors can be passed back to an error handler in a procedure that called the procedure that caused the error. This requires that the top most procedure has the On Error Resume Next statement and that lower procedures do not. For example...*(this example will not work in Netscape 3.0 unless you have the plug-in installed.)*

```
<html>
<head>
<title>Error Object Testing </title>
</head>
<body language=VBScript onLoad="Init">
<script language="VBScript" >
    Option Explicit

Sub Init
    '---- prime the error trapping
    On Error Resume Next
    '---- Display a message box to indicate the script has started
    MsgBox "Started"
    '---- call the procedure
    Call ProcCauseError
    '---- trap the error object, caused by the procedure ProcCauseError
    If err.number <> 0 Then
        '---- Display information about the error in a message box
        MsgBox "Error Number : " & err.number & " Error Description : " &
            err.description & " Error Source : " & err.source , 0,
            "My Error Trap"
    End If
End Sub

Sub ProcCauseError
    Dim a, b
    '---- Initialise "a"
    a = 10
    '---- Divide "a" by zero thus causing an error
    b = a / 0
End Sub
</script>
</body>
</html>
```

In this example the error trapping is in the procedure *Init* but the error is caused in the *ProcCauseError* procedure. Even though the error occurred in the called procedure, error trapping was only enabled in the calling procedure. The error object ( *err* ) supports the following properties...*Number, Description, Source, Helpfile, HelpContext*. The *err* object has two methods *Raise* (used to create an error condition) and *Clear* (which resets the error condition).

Listing 5 – VBScript error handling function.

example creates a *car* object with the model property set to "gti", and invokes the *repayments* method to calculate its cost.

The language provides an extended *for* statement for iterating through the properties of an object. The *for...in* statement is used as follows:

```
for (var_name in object) {
/* body of for statement */
}
```

The *with* statement can be used to reference multiple properties of an object without having to repeat the object's name, for example:

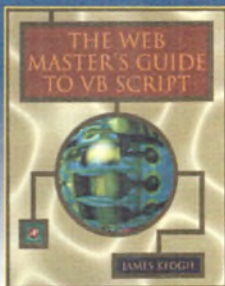
```
with (object_name) {
/* statements using object's properties */
}
```

There is no direct support for inheritance within the language, however objects can be nested to attain a form of object hierarchy.

### Handling run-time errors

Error events are raised whenever a JavaScript syntax or runtime error occurs. They are handled by the *onError* event handler, which can execute JavaScript code to deal with the problems. The event handler can be set to call a custom error handling function, which must take a message string, a URL and a line number as arguments. The

## Master VB Script and Java Script with AP Professional



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This book discusses VB Script, an Internet scripting language based on Microsoft's Visual Basic that can be integrated into HTML code and which sets properties and methods on OLE Controls and Java applets. The book covers database management, security issues, set-up information, and design principles. It also gives an overview of HTML and an in-depth explanation of how to integrate VB Script into HTML code. Also, the book compares and contrasts VB Script with JavaScript and other competing technologies.

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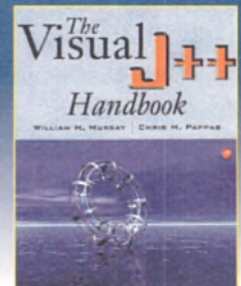
### Java and JavaScript Programming

Peter Wayner

This book teaches readers to program using Java and JavaScript, as well as when to use one or the other. The author focuses on developing the type of applet that users are likely to develop themselves. Peter Wayner is a well-reviewed technical writer with expertise in C++ and Internet-related issues. Readers will be able to adapt his code shared in this book with little or no effort to fit specific needs.

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### Visual J++ Handbook

William H. Murray

Chris H. Pappas

The Visual J++ Handbook is a detailed introduction to Java using Microsoft Visual J++. It discusses the Microsoft Java tools in depth. After a brief introduction to Java and the compiler, you will be led through the language features, creating simple applets and using the Microsoft tools. Then, after an introduction to the programming environment, you will get into the good stuff – adding colour, sound, fonts, dialog boxes, menus and animation.

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function can trace and report errors itself, and can opt to disable the standard JavaScript error reporting dialogue. Setting `onError` to null disables error reporting (setting `window.onError` to null will prevent the user seeing any errors caused by your code). Note that error events are not triggered by browser errors: for example, `onError` cannot intercept an 'invalid URL' message. Listing 4 contains a simple error handler, which produces output similar to:

```
Error Report
Error in file: file: filename
Line number: 0
Message: noSuchFunction is undefined
```

```
var x = 10
var y, z = "15"
var s = "hello"
x      is an integer initialised to the value 10
y      is not initialised to any type
z      contains a string "15"
s      contains a string "hello"
```

All operands within an expression are converted to the type of the leftmost operand:

```
s + z    = "hello15"
s + x    = "hello10"
x + z    = 25
x + s    causes an error, since the string s
          cannot be converted to an integer
```

Figure 2 – JavaScript operator overriding.

VBScript's error handler comes in the form of an error object `err` and the `resume` statement. The error object has several properties to help identify errors, plus two methods, `raise` and `clear`. Listing 5 contains some simple VBScript error trapping code, which shows two nested subroutines with propagation of errors through the calling tree.

### Tools of the trade

New development environments for Internet-based applications are springing up on an almost weekly basis. Some are genuinely good and well thought out products, but many vendors just seem to be jumping onto the Java bandwagon for the sake of it.

Microsoft looks set to dominate the PC-based Internet development market, having at its disposal an arsenal that includes two products which I currently use: ActiveX Control Pad and the excellent Visual J++. Control Pad is basically an HTML tool that lets you drop ActiveX controls directly into a form (similarly to using VB4), while Visual J++ adds Java development capabilities to Developer Studio, with graphical debugging and a very fast Java code compiler (see the full review in this issue on page 59). Other products to look out for are being released by Symantec and Borland.

It is impossible to discuss all of the merits of both scripting languages in such a limited space: bookstores will have shelves full of books on the subject. As for picking the best scripting language, it really is a matter of examining which features you need for the job at hand. One point to bear in mind, though: JavaScript is the only language that is directly supported by both Netscape and Microsoft browsers. As with any new language, the secret to success is to get out there and use it. Happy coding. ■

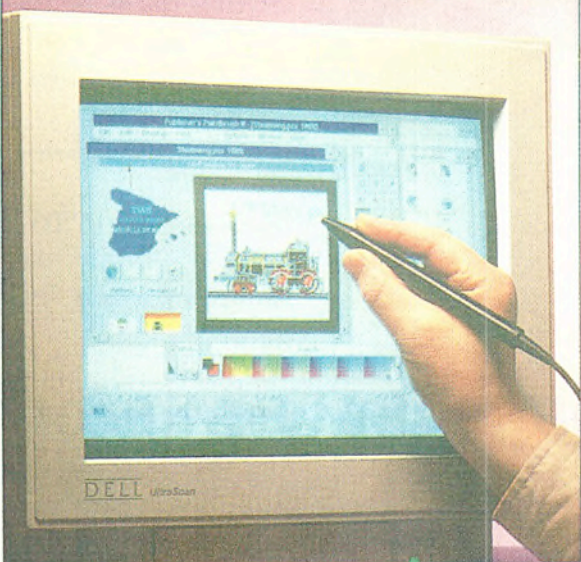
Roy Tynan is the Technical Director of Manchester-based hardware and software design company, The Pixel Factory. Their software expertise covers real time embedded micros, Windows software design and Interactive Internet / Intranet solutions. Roy can be contacted via email at [roy@pixel-factory.com](mailto:roy@pixel-factory.com). URL: <http://www.pixel-factory.com>.

Additional information can be found at the URLs: <http://www.microsoft.com/vbscript> and <http://home.netscape.com/eng/mozilla/3.0/handbook/javascript/index.html>.

The code of a VBScript function to validate credit card numbers can be found at <ftp://ftp.exe.co.uk/pub/exestuff/vbscript>

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# The product formerly known as JAKARTA

Visual J++ aims to unite Java with COM and the Developer Studio environment. **Dave Jewell** lifts the veil to see if its a productive relationship.

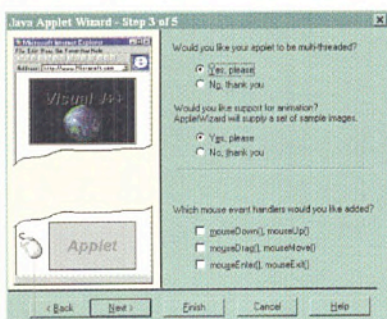
When I first telephoned Microsoft's PR company to enquire about its forthcoming new Java development system, there was considerable surprise and dismay that I had dared refer to it as 'Visual J++'. That name is under non-disclosure, I was sternly warned. I pointed out that the American trade press had been referring to it by the same name for some weeks, but to no avail. I hadn't signed the magic bit of paper and therefore had to refer to the product as 'Jakarta' or risk a good spanking. I duly complied...

The wisdom of bringing out a product which differs by only one letter from an existing product name might seem questionable, but 'Visual J++' actually gives a good indication of what's to come. The system is built around exactly the same Developer Studio environment that will already be familiar to Visual C++ users. In fact, Microsoft has recently been hinting that Visual Basic 5.0 will use the interface as well. The bottom line is that, love it or loathe it, you're going to have to get to grips with Developer Studio at some point.

## Java Development Environment

Personally, I love it, and the integration of the Java tools is great – you can work on C++ and Java projects from the same environment, with full access to the InfoView system for browsing the MSDN CDs. As with Visual C++, J++ places a strong emphasis on on-line help and includes a large number of sample applets which can be installed directly from the help system. For those who prefer printed documentation, the shrink-wrap version will include a copy of Microsoft Press' *Learn Java Now*, complete with the sample programs on the CD.

The Visual J++ CD includes a copy of Internet Explorer 3.0, which shares some components with the system, and is required for debugging Java code embedded within HTML documents. The Java debugger itself is everything that a seasoned Visual C++ programmer would expect – Java programs can be debugged at the J-code level (the portable interpreted byte code that runs on the Java Virtual Machine), and there's full support for multi-threaded code. You can debug applets while they are in use on a



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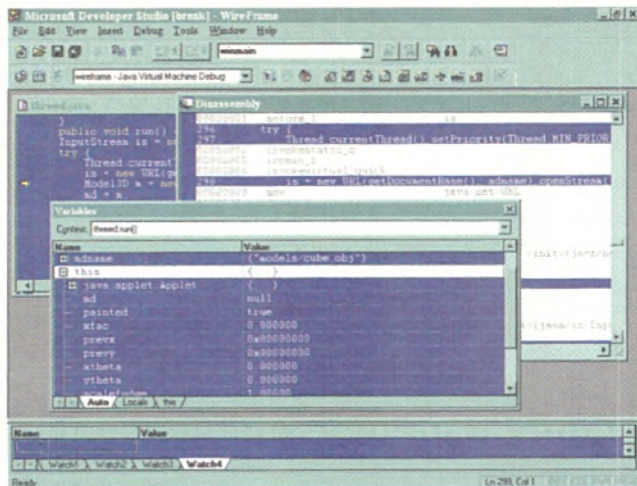
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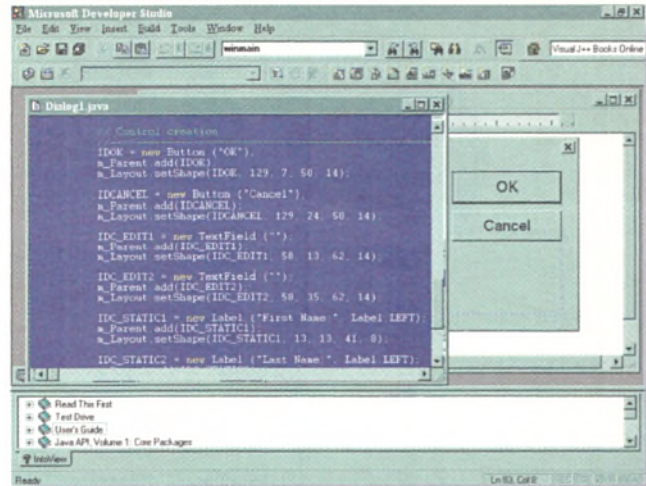
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*The Developer Studio debugger now speaks Java! Here, the hierarchical Variables window is in 'auto' mode, showing the state of the variables present on the current source line. Behind, you can see the disassembly window displaying Java byte code.*



*The Resource Wizard takes an existing resource template or compiled template file and generates the equivalent Java source code. Here, you can see the code used to generate each of the controls corresponding to the dialog box in the window behind.*

browser page, and can even work with multiple applets embedded in the same page. The familiar interface is present, too: the hierarchical 'variables' window's 'auto' pane displays the state of all variables used by the current statement, and variables can be examined with the 'DataTips' technology.

The IDE contains a new Java applet wizard, offering options including creation of sample HTML files, making applets multithreaded and building in animation support. The wizard can set up mouse-event handlers, and has a nice option to produce a list of the applet's required parameters. One required decision is whether a project will be an applet or Java application – note that a Java program compiled as a stand-alone application is not a pure machine code EXE file: the Java interpreter and run-time environment are still required. However, Microsoft has committed to producing a native-code compiler in a future release of the system.

The environment includes a resource wizard, which scans an existing .RCT or .RES file for dialog box and menu resources, and creates a new Java source file containing the equivalent definitions. The big advantage of this approach is that it enables you to use Developer Studio's integrated resource editors to lay out a project's menus and dialogs visually before converting them into Java source. The dialog manager code requires the `DialogLayout` custom layout manager, which maps Win32 DLUs (Dialog Logical Units) into the Java co-ordinate system. The source file containing the control is automatically generated in the same directory as your other files.

## COM & ActiveX – Trojan horse

A particularly interesting aspect of Visual J++ is its support for COM and ActiveX technologies, including the new DCOM standard shipping with NT 4.0. The system enables COM objects to be accessed directly from Java code just as easily as if they were native Java classes. At the same time, you



can use Visual J++ to create ActiveX components which can be incorporated into Web pages or accessed from other ActiveX-aware development systems such as Visual Basic or Delphi. Microsoft has achieved this without making any syntactic changes to the language, but rather by cunningly overloading the language semantics (described in detail below).

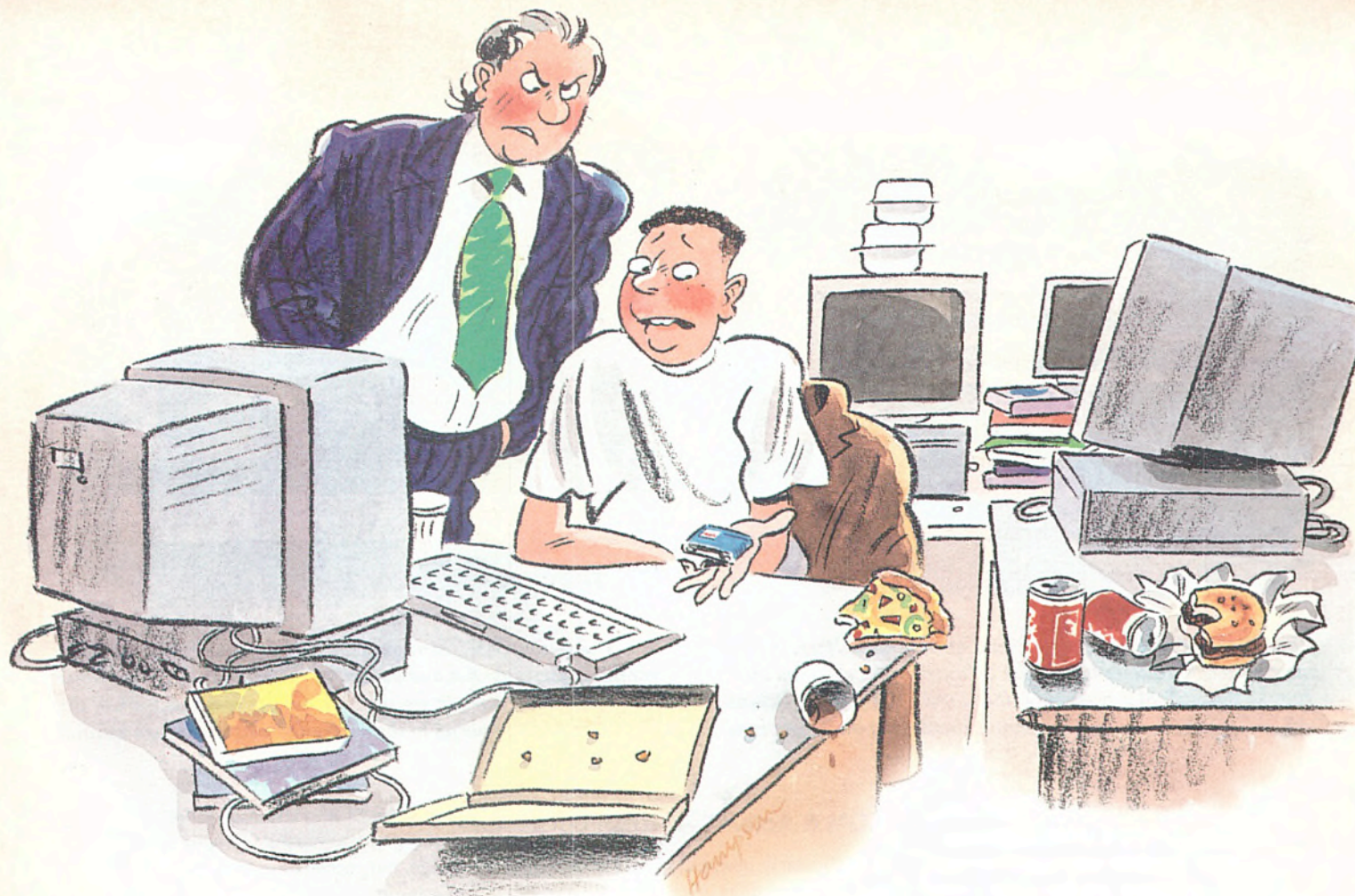
Using Visual J++, you can access COM objects directly from within a Java application and use them as conveniently as native Java classes. Microsoft has integrated COM

into Java in an elegant manner without making any syntactic changes to the language, but rather by cunningly overloading the language semantics. (See later for a fuller description of how this has been achieved). At the same time, you can even use Visual J++ to create ActiveX components which may then be incorporated into your Web pages or accessed from another ActiveX-aware development system such as Visual Basic, Visual C++ or Delphi.

The COM/ActiveX emphasis has been something of a bone of contention between Microsoft and the wider developer community. To put it bluntly, there are some who see this as a blatant attempt by Microsoft to hijack Java for its own purposes. I have in front of me a recent copy of the *American Object Magazine* which contains an article entitled *Microsoft's Java strategy: embrace now, smother later?* This is a fear shared by those who wish Java to remain as a platform-independent, open standard.

In a bid to win over the doubtful, Microsoft has released control of the ActiveX, COM and DCOM specifications to the Open Group (see the news section for more details). The idea behind this is that ActiveX will, like Java, become a platform-independent standard supported by all Web browsers and Java development systems. But let's think about this a moment: does this scenario really allay your fears or does it reinforce them? It's no secret that sooner or later, the massive (and still growing) Windows API will need to be subsumed into a more elegant and manageable object-oriented interface. Better yet, why not wrap the entire API up into a number of neat COM





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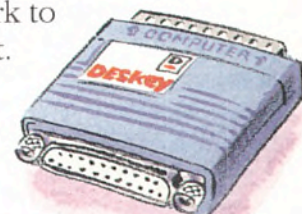
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objects and provide 99% of the API's functionality in a platform-independent manner? Looked at from this perspective, Java suddenly becomes a great way for Microsoft to get a whole new generation of programmers developing for Windows, even if it wasn't its original intention. It's also a great way for existing developers to escape the confines of the Intel platform. However you view things, it's another win-win situation for Redmond.

### Java + COM == Java++?

As mentioned above, one of the most intriguing aspects of Visual J++ is the way in which Microsoft has integrated COM support into the language without adding any new syntax. Everything works by overloading the existing language semantics: for example, an apparently simple assignment statement might now involve the OLE API, multiple method calls and so forth. All this happens behind the scenes so that much of the inherent complexity of OLE programming is hidden from the programmer. Using a COM object in Java is *much* less work than in C++.

To see how this works in practice, let's take a few simple examples. In C++, you would typically call the **CoCreateInstance** API routine to create an object of the class associated with a specified CLSID. For example, to return an interface pointer to a Notebook control, we might see something like this in a C++ OLE container application:

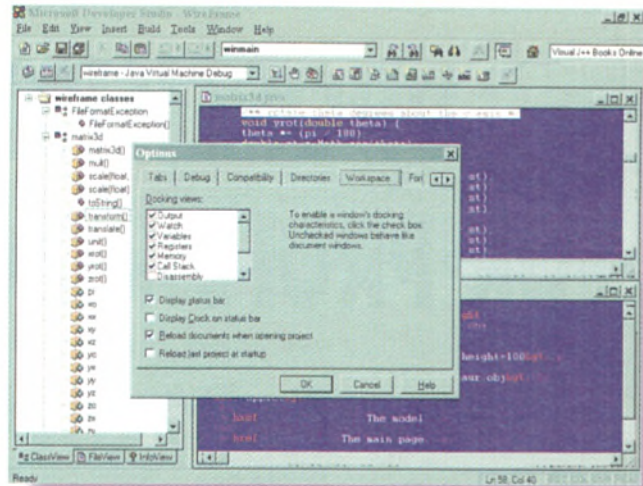
```
HRESULT hResult;
INotebook * pNotebook;
hResult = ::CoCreateInstance (clsid,
    NULL, CLSCTX_LOCAL_SERVER,
    IID_Unknown, (void **) &pNotebook);
```

In this example, we pass the CLSID of our Notebook control as the first parameter. The second parameter is **NULL** to indicate that we're not interested in an aggregate object and the third parameter describes

what sort of server is being run – in this case a local server which doesn't run in our process space. The fourth parameter tells OLE which interface we're interested in, and the final parameter tells OLE where to put the interface pointer. I won't explain these

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terms in great detail because the emphasis here is on demonstrating how neatly Java blends into the OLE way of doing things. So, how do we rewrite the above code in Java?



*Visual J++ uses the Developer Studio environment, with syntax highlighting available for Java and HTML source files. As with Visual C++, ClassView and FileView provide different 'views' into your current project.*

Very simply, as it turns out:

```
INotebook m_Notebook;
m_Notebook = (INotebook) new Notebook();
```

To create an instance of a COM object, it's only necessary to use the **new** operator in a way that's completely natural to Java programmers. In fact, unless you know that **INotebook** happens to be a COM object, you might think this is pure Java. The assignment statement may look like it only contains a simple cast, but a lot more is going on behind the scenes: the **CoCreateInstance** API is accessed just as it was before, but it's transparent to the developer. The Java compiler reads the type library of the referenced COM object, and builds a list of methods and properties associated with it. Armed with our freshly-created COM object, we can now easily reference methods like this:

```
// Empty the notebook
m_Notebook.Clear ();
```

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One thing that you can't do is create an instance of a COM object directly. You *must* create the COM object by casting the right-hand side of the 'new' statement to the required interface type. You can't write:

```
// Don't do this !!!
MyWombat w = new MyWombat();
```

This code will compile – it's perfectly valid Java syntax – but any attempt to access methods or members of the object will cause a run-time error.

In Java, an 'interface' is a way of specifying the behaviour of an object without actually defining the details of its implementation. The language uses interfaces to eliminate many of the troublesome aspects of C++ which arise from using multiple inheritance. More importantly though, the approach fits in very well with the OLE view of the world, which is based on an object making one or more interfaces available to interested parties.

Microsoft has integrated COM into Java in an elegant manner by cunningly overloading the language semantics

In the above example, we've leapt straight in and assumed that there's an interface of type **Notebook**. If the **INotebook** object does not support this interface, an exception of type **ClassCastException** will be thrown. If you don't want to worry about catching exceptions, you can use Java's existing **instanceof** operator to check that a particular interface is available.

Another important component of the OLE API is **QueryInterface**, which is used to retrieve a pointer to a new interface for an OLE object. In C++, we might see something like this:

```
// m_Notebook points to an object
// that (hopefully!) supports IPhonelist
IPhonelist * pPhonelist;
m_Notebook->QueryInterface
    (IID_IPhonelist,
     (void **) &pPhonelist);
```

This example calls **QueryInterface** to obtain a new interface pointer to the **IPhonelist** interface of the **m\_Notebook** object that we created above. In Java, this is even simpler, with the details again handled through what looks like an ordinary typecast:

```
IPhonelist m_Phonelist;
m_Phonelist = (IPhonelist) m_Notebook;
```

## Reference counting

Because OLE supports the idea of multiple interfaces being handled by the same object, it's easy to end up with a number of interface pointers, all of which refer to the same object, even though they point to different types of interface. How can we tell if two pointers both refer to the same object? In C++, a direct comparison of the two pointers will naturally fail since the two pointers always point to different locations in memory. In order to get around this, C++ programmers have to resort to a kludge like this:

```
// comparing pPhonelist and pNotebook
IUnknown pUnk1, pUnk2;
pPhonelist->QueryInterface
    (IID_IUnknown, (void **) &pUnk1);
pNotebook->QueryInterface
    (IID_IUnknown, (void **) &pUnk2);
if (pUnk1 == pUnk2) {
    // The same object
} else {
    // Different objects
}
```

In this example, **QueryInterface** is used to obtain pointers to the **IUnknown** interface of both objects (remember that COM uses the **IUnknown** interface to establish object identity), which are then compared. Of course, this code could be simplified, but you can see that testing for equality isn't as simple as it might be. In Java, however, the test looks like this:

```
if (m_Phonelist == m_Notebook) {
    // The same object
} else {
    // Different objects
}
```

Because the Java language does not use pointers, a direct comparison of two interface objects can be given completely different semantics. Under the hood, the Java run-time code may be calling **QueryInterface**, or storing the **IUnknown** interface pointer as part of its representation of a COM object. Either way, the effect is the same as the C++ code, but much more readable and elegant.

Another issue that must be dealt with in C++ COM programming is reference count-

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ing. I've just given you a couple of examples of how the **QueryInterface** API is called, but I haven't told the whole story. The OLE library maintains a reference count for every interface pointer that it dishes out. Each time that **QueryInterface** returns a reference to a specific interface, it increments an internal counter for that interface. When you call **Release** (another API function) to dispose of an interface, the interface's reference count is decremented. The library disposes of the internal data structures which maintain the interface when the reference count reaches zero. Thus, if you make a copy of an interface pointer and hand it to someone else, you have to call **AddRef** to advise OLE of the new reference. Frankly, the whole thing amounts to a major pain in the neck. It means that responsibility for keeping track of reference counts is placed on the programmer. Get it wrong and your interface might either disappear ahead of time or else not be de-allocated at all.

Happily, all this nonsense disappears when we move over to Java. The Java runtime system efficiently manages all references to dynamically created objects (both ordinary Java objects and COM interfaces) and the built-in garbage collector automatically keeps track of how many references there are to an object. You don't even need

to call **Release** when you're done with an interface – it all happens automatically.

## COM vs Java Beans

As you'll no doubt be aware, Sun has responded to Microsoft's ActiveX initiative by launching an initiative of its own in the form of Java Beans, intended as an architecture for creating platform-independent software components. I couldn't help but smile at the number of subtle little bean-oriented comments which I spotted in the latest edition of Microsoft *Developer News*. Eg 'That sure beats having to grow your own beans by writing everything from scratch in Java.' Whichever way you look at it, the battle for the Internet has moved into high gear and Visual J++ is going to be a very important weapon in Microsoft's arsenal.

The Internet aside, an increasing number of developers are being attracted to Java simply because it gets right so many of the things that just didn't gel in C++. The inherently higher level approach of Java (when compared with C++) brings major benefits to the programmer: developers are released from much of the tedious 'grunt-work' which often has little to do with the task in hand. This is true of something like (say) garbage collection in a general sense, and with COM programming in particular. Packages, built-

in thread support, interfaces rather than messy multiple inheritance, and the promise of platform independence all add up to a very enticing combination.

At the present time, Visual J++ represents the best Java development environment currently available on the Intel platform, largely because of its ActiveX support. And even if you aren't interested in Java for itself, it's a great way to build COM objects. Of course, all this may change: Borland is still hard at work on Latté, a development system which looks a lot like a Java version of Delphi, and Symantec is finalising Visual Café (not to be confused with its existing products). For the moment, Visual J++ looks like the one to go for, but watch this space...

*Dave Jewell is a freelance consultant, programmer and technical author. You can contact Dave as DSJewell@aol.com, 102354.1572@compuserve.com or DaveJewell@msn.com.*

*Microsoft Visual J++ is available from Grey Matter (01364 654100) at £75 until the end of November. It is also available at £75 from System Science (0171 833 1022), and £79 from QBS (0181 956 8000).*

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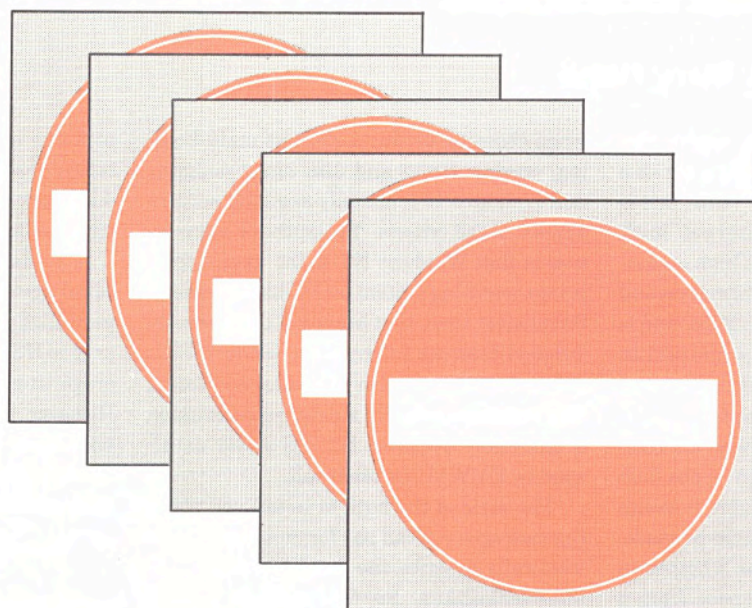
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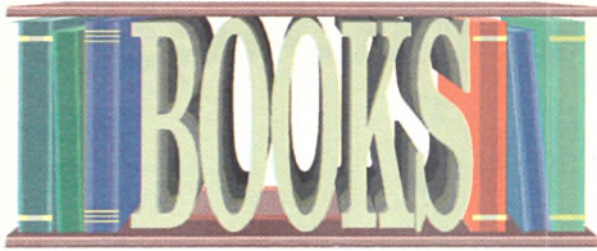
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## Go Web! reviewed by Mary Hope



**D**espite the gung-ho title, this is an internet book that is high on useful information and low on hype, and is doubly unusual in that it is by a UK

author and thus has UK references.

The book is aimed at those who are committed to publishing information on the Web and need to know how to go about it. It covers all levels of the decisions that must be made, from managerial issues such as whether to set up a Web server or rent space from a provider, to the hands-on work of HTML authoring – and it is on this subject that the book proves its worth. Chapters cover the structure and tags of HTML 2.0 and all its extensions, editing tools and file formats, and there is a substantial collection of tips for achieving interesting graphical effects.

The section on Web servers contains a brief discussion of the features to consider

when choosing products, such as multi-homing, proxy services and user agent support, and evaluates 10 commonly available servers against these criteria. The author's assumption is that Windows NT is the most appropriate operating system for PC-based servers. Surprising, then, that Microsoft's NT Server-bundled Internet Information Server (IIS) is not included in the list of products covered. The book also includes a detailed description of the freely available HTTPS server developed by EMWAC for Microsoft.

The style of the book is to tell you about the packages you can pay for, but then enthusiastically describe the details of downloadable lookalikes. So for example in the graphics section, Corel Draw and Illustrator are mentioned but it is Paint Shop Pro (with its free 30 day evaluation period) that is the basis of the chapter. This passion for all things cheap made me assume the author must be an academic, and I was surprised when the jacket listed him as an 'internet consultant'. Perhaps on reflection it is a characteristic of 'Webbies' to believe that the nat-

ural way to obtain software is to download it, rather than paying for the packaging. If you don't want to spend the time downloading the package, however, it's included on the CD.

The danger faced by any Web book is rapid ageing. For instance, although it was published in 1996, the book omits any reference to IIS, and the mere 4 pages of Java coverage looks a bit thin by today's standards. However, the resource guide at the end of the book lists a set of URLs comprehensive enough to provide updates on all the latest Web technology.

### ✓ Verdict: Recommended

<b>Title:</b>	<i>Go Web! Dynamic Internet Publishing on the PC Platform</i>
<b>Author:</b>	David Harvey-George
<b>Publisher:</b>	Thomson International Computer Press
<b>ISBN:</b>	1-85032-251-1
<b>Price:</b>	£24.95
<b>Pages:</b>	276 plus CD-ROM

## Effective AWK Programming reviewed by Paul Dunne



**T**his book is both a tutorial and official reference manual for GNU AWK (or GAWK). Although GAWK is now probably the closest thing to a definitive version of the

Unix AWK program, other implementations do exist, and the book goes to some length to point out the differences between them, including coverage of the POSIX standard. In particular, the final chapter, 'the evolution of the AWK language' provides useful detail on the divergence of the various versions.

The book does a very good job of explaining the language, and goes into plenty of detail on all the important features. In particular, I was pleased to note the emphasis given to associative arrays – one of the great strengths of AWK (and Perl), and all too often given little attention in books about the language.

There are plenty of programming exam-

ples (a whole chapter of them, in fact), and another section of handy library routines. One minor criticism: many of the programs, as the author freely admits under a heading of 'Reinventing Wheels', are merely AWK implementations of common Unix utilities. This 'gee whiz, look at all the stuff AWK can do' approach reaches its worst in section 16.2.2: 'An alarm clock program'. Okay, so maybe you *can* do anything in AWK, but this is pushing it: a shell script to do the same thing would only be a few lines long. I for one would have preferred more in the way of fresh solutions to practical problems, as in the latter half of the chapter. I suppose it could be argued that these programs would be useful to an AWK user on a 'foreign' system, without the utilities that a Unix user takes for granted (and, indeed, the book has an appendix with details about using GAWK on non-Unix platforms).

On the other hand, some are very useful programs. The best is an `#include` processor, rather like a simple version of the C pre-

processor, implemented with the Bourne shell and AWK. This is a fine program, reminiscent of the climatic chapter of the classic *Software Tools* by Kernighan and Plauger.

The book is certainly an unmatched reference source, but its merits as a tutorial are less marked. It relies heavily on forward references – that is, using features of the language before they have been defined. This would, in my opinion, make things rather heavy going for novices. Dale Doherty's book 'Sed and AWK', published by O'Reilly, would serve as a much better introduction for beginners.

### ✓ Verdict: Recommended as a reference

<b>Title:</b>	<i>Effective AWK Programming</i>
<b>Author:</b>	Arnold Robbins
<b>Publisher:</b>	SSC
<b>ISBN:</b>	0-91615-188-3
<b>Price:</b>	\$27.00
<b>Pages:</b>	336



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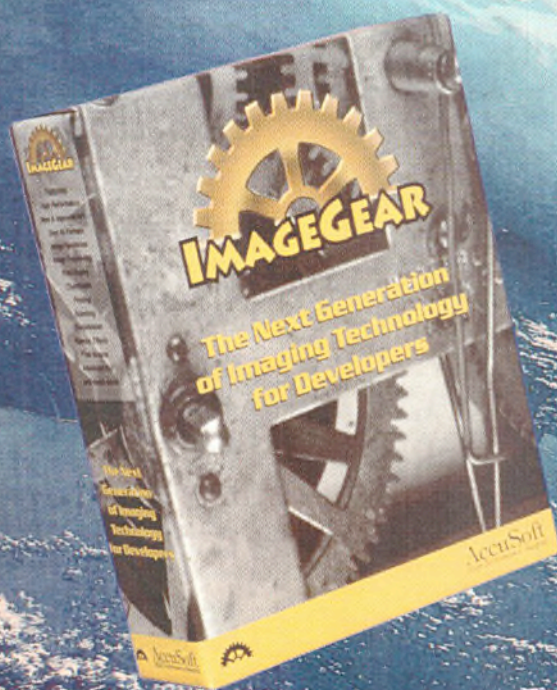
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#### Platform/ operating system

- 101 ☐ Apple Mac
- 102 ☐ PC/LAN
- 103 ☐ UNIX
- 105 ☐ IBM AS-400
- 106 ☐ Client-server
- 107 ☐ Windows
- 199 ☐ Other

#### Turnover

- 301 ☐ £0-£1 million
- 302 ☐ £1m-£10m
- 303 ☐ £10m-£50m
- 304 ☐ £50m-£100m
- 305 ☐ £100m-£1bn
- 306 ☐ £1bn+
- 307 ☐ Public sector

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**'C' Programmers**  
London up to £25,000  
**The Company:** Software house experiencing explosive growth and constant new business.  
**The Position:** 'C' application programming in a large number of short term projects, hence great job variety.  
**The Person:** Strong knowledge and experience of 'C', also of Windows 3.11, 95 & NT MFC/SDK 32-Bit programming. Some VB knowledge an advantage as is Novell.  
Ref: JA - 101EX

**'C' / C++ Windows NT development**  
West Sussex to £35,000 + Benefits.  
**The Company:** Expanding software house providing systems and solutions to a number of industries in the IT sector.  
**The Position:** Using OO techniques you will be developing database and graphical communication systems.  
**The Person:** Degree educated you will need to have previous development experience of 'C' and C++ along with UNIX and/or Windows NT. Any MFC or Motif experience will be an advantage.  
Ref: TS - 101EX

**Xwindows C++ & Sybase banking systems**  
London (E1) to £40,000.  
**The Company:** One of London's seven main financial exchanges.  
**The Position:** You will be developing UNIX based GUI systems using C++ & 'C' for us on an active trading floor which are connected to a main Sybase database.  
**The Person:** Degree qualified (first or 2:1) with good commercial experience of 'C' / C++, UNIX and Sybase. Further experience of Xwindows/ Motif would be useful as would knowledge of trading floors.  
Ref: DL - 102EX

**C++ UNIX Financial Software House.**  
City to £35,000 + Benefits.  
**The Company:** Develop systems for futures and options used by banks and financial institutions.  
**The Position:** Senior Software Engineer to develop UNIX based financial systems using C++ within an Object Oriented Environment.  
**The Person:** 2-3 years commercial experience of C++ & UNIX preferably within an 'OO' environment. Previous financial experience not necessary.  
Ref: DL - 101EX

**'C' / C++ & Telecommunications**  
Hampshire to £25,000 + excellent benefits.  
One of the UK's expanding telecommunications companies are looking to recruit highly skilled professionals to join their expanding team. Degree educated you will have considerable experience in software development using 'C' or C++. For this position you will be working in a team environment developing software using the latest technology. In return our client offers excellent career opportunities along with a full benefits package.  
Ref: TS - 102EX

**'C'/UNIX Application Programmer.**  
City up to £25,000 + Benefits.  
**The Company:** Large provider of contract chauffeur and taxi services to major corporate clients.  
**The Position:** Support and technical backup, also system development in 'C' & UNIX. Problems diagnosis, solution implementation, systems design.  
**The Person:** Educated to at least 'A' level, preferably Graduate level, with 2 years experience of 'C' programming in a UNIX environment. Previous experience of a support role, real-time development and TCP/IP is highly desirable.  
Ref: JA - 102EX

**'C' & UNIX New Developments.**  
Aylesbury £21,000 - £26,500.  
**The Company:** Internationally known software house who develop many well known and award winning shrink wrapped software products.  
**The Position:** To work within the R&D group on new product development. This is a flexible company with regard to hours and dress code.  
**The Person:** Experience within 'C' or C++ under any flavour of UNIX. Ideally you will have gained at least 1 years commercial experience of the above.  
Ref: JJ - 101EX

**New Advanced Financial Applications.**  
City up to £35,000 + Benefits.  
**The Company:** Financial software house involved in innovative and technically advanced financial applications.  
**The Position:** Working within the Client Server group on new applications for broking and banking clients.  
**The Person:** You will be goal driven with previous development experience of 'C' & UNIX. An interest in financial business would be beneficial.  
Ref: JJ - 102EX

**Pay Rise for Powerbuilder.**  
Central London, £35,000 - £45,000  
**The Company:** Renowned consultancy offering a wide variety of projects working with world class financial institutions.  
**The Position:** Working on a full project life cycle for high profile financial systems using Powerbuilder V5 with either Oracle or Sybase.  
**The Person:** Successful IT Professional with at least six months solid Powerbuilder V4 or V5 experience and significant exposure to any Relational Database technology.  
Ref: MD-101EX



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## REAL-TIME

**C++/ REAL-TIME**  
Herts - To £30K  
Our client is predominantly a developer of software and a supplier of computer systems and associated support services for retail applications. Candidates should have experience of real-time applications and either two years of 'C' / C++ under UNIX or Visual/Borland C++ in a Windows environment, preferably using the class libraries. You must be able to work well within a team.  
Ref: CP/1

**'C' / C++ REAL-TIME**  
Bucks - To £22K  
Our client develops chips and software for the video conferencing industry. They are searching for candidates with a minimum of two years 'C' / C++ programming, with experience of embedded real-time applications. Applicants must be highly self motivated and a team player.  
Ref: CP/2

**EMBEDDED 'C' / C++**  
Berks/Avon - £15K - £30K  
A range of Software Engineers are required with a minimum of one year's embedded 'C' programming skills to develop software for a variety of projects. Development will be under a Motorola 68000 operating system on a PC host. Any UNIX skills would be advantageous. The successful applicants will be working for one of the UK's leading Software Houses which currently is expanding into the European markets.  
Ref: DE/3

## UNIX DEVELOPMENT / SUPPORT

**TEAM LEADER**  
N. Home Counties - To £38K+bens  
We are seeking a high calibre Team Leader/Project Manager for a leading supplier of open systems software. Responsible for up to seven people, the successful candidate will be involved in influencing and driving the strategic direction for technology. Candidates should have at least five years computing experience including a year as a Team Leader, two years 'C' programming experience and UNIX to system administration level.  
Ref: LC/4

**X WINDOWS / MOTIF**  
Cambs - £20K-£30K  
Excellent opportunity to develop a leading GUI product for the next century. Candidates should have at least four years post-graduation experience where they gained good 'C' / UNIX programming skills. In-depth knowledge of X-Windows and Motif essential.  
Ref: DE/5

**SOFTWARE TESTER**  
Herts - £25K - £32K  
Our client, a leading supplier of open systems software, is currently seeking an additional Software Tester. For these challenging roles, candidates must have UNIX experience along with a grounding in shell programming and networking. Understanding of 'C' or C++, a knowledge of commercially available tools and familiarity with PC hardware is also required.  
Ref: LC/6

**OO X-TRAIN TO JAVA**  
Herts - To £40K  
This British company is developing networked products for the US market and requires additional software engineers. Candidates should be educated to degree level and have at least four years software development experience including object oriented programming. Our client will be using JAVA for all its development work, so training will be given to the successful candidates.  
Ref: LC/7

**UNIX / SYBASE**  
C. London - £32K + BB  
We require an Analyst Programmer for the financial sector, based in Piccadilly. Working as part of a small team on development and maintenance of the in-house trading system, using Sybase and ideally Powerbuilder, under UNIX. You will assist Fund Managers in identifying system requirements and you will act as project manager for minor projects.  
Ref: RC/8

**SENIOR TECHNICAL SUPPORT**  
West London - £30K + car  
Our client, a software house developing cross-platform client server software. They are seeking a technical support specialist to support developers of the latest generation of 4GL tools for UNIX, MS Windows and OS/2. You will have at least some experience of supporting the above as well as being a high achieving ambitious individual.  
Ref: JK/9

## 'C' / UNIX

**'C' / UNIX / Device Drivers**  
Berks - £20K - £35K  
Experienced 'C' / UNIX Systems Engineers required for this telecommunications division of a major software company. Positions are available at all levels, for engineers with recent experience of device driver development and/or network management. Rewards include competitive salaries and interesting working environment.  
Ref: JK/10

**SYSTEMS ENGINEER**  
Herts - £25K - £35K  
Systems Engineers are required by this US software products supplier. Suitable candidates should have at least two years 'C' and UNIX experience. Whilst not essential, device driver writing and/or operating systems internals experience (preferably UNIX) will be highly desirable. These positions will appeal to people who enjoy working in a technology strong team environment.  
Ref: LC/11

**'C' / UNIX DEVELOPER**  
BERKS - To £30K  
Our client is a leading supplier of Systems Management software and services for Open Systems. The emphasis is on providing solutions, not just products, with services being a big part of the company's offering. They are looking to extend their development with people who have a practical knowledge of UNIX with design and programming experience in 'C' and Shell Environments.  
Ref: RC/12



## IT'S TIME FOR A CHANGE

Another year is nearly over and nothing has changed over the last two years, your bored with your current project, your best friend has a better job than you have and he's on more money than you, what do you do?

It's time to talk to us, we can connect you to some of the best positions in the South East, you will not only attract a higher salary but the projects will be different and exciting, there will be new colleagues to work with, a new set of friends and always with the promise of even better opportunities to come. Don't wait any longer, call us before you do anything else and make that move.

## Space Engineering to £30K(UK)

This company a designer of OO Software for the Worlds Space Industries including the European Space Agency has won new contracts both for the UK and in Europe.

They seek Degree qualified software engineers with a strong background in Object Orientated development gained ideally in a similar software development environment but good general applications developers are also of real interest, particularly those with experience of safety critical software or from a defence background.

You will need a minimum of 1 year post graduate experience of software design using C++ in a UNIX environment. Any experience of Team Leadership for senior positions will also be of interest.

The company offers an excellent salary (basic to £30K in the UK) + benefits including substantial overseas allowance for European based positions.

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PICS Developers with NEC 7xxx assembly language	Please call
Software Engineers for technical applications, experienced in 'C', Pascal or 'C++' under VMS, UNIX or Windows	to £20,000+bonus
DBA with INGRES or SYBASE or ORACLE	£22,000 to £25,000
Customer Support Manager to lead a small applications support team & introduce professional service levels.	to £30,000
Tech Support Supervisor with network and modem skills	to £17,000
Software Development Manager for client server environments ( UNIX server & VB / Windows front ends)	£25,000
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For your next career move around West Yorkshire telephone  
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£17-£35K + benefits REF: SC/01/EXE

### WINDOWS OR X-WINDOWS/BANKING

### ALL LEVELS

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

### C AND C++ PROGRAMMERS

### ANALYST PROGRAMMERS

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

£17-£25K + Banking benefits

REF: SC/03/EXE

### CAMBRIDGE - MANY, MANY EXCITING OPPORTUNITIES

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

### INGRES/ORACLE/SYBASE/GUPTA/OOD AND OOP

### ALL LEVELS

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

£18-£40K + benefits

REF SC/05/EXE

### C/C++/VISUAL BASIC/UNIX/WINDOWS 95/NT SERVER

### DEVELOPERS

Software House and End Users in Finance, Banking, Manufacturing, Commercial, Scientific and Government application environments require excellent C skills. Both Windows development skills W3.1 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 Orientated Databases. Graduates through to senior software engineers/team leaders are required. Please call to discuss.

£14-£35K + benefits

REF: SC/06/EXE

### UNIX/VMS/WINDOWS 3.1/95/NT MFC/C/C++

### ALL LEVELS

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

£16-£28K

REF: SC/07/EXE

### LONDON/HOME COUNTIES WINDOWS SDK/NT DEVELOPMENTS

#### Senior Development Engineers

#### Analyst Programmers

To £30K + benefits

To £27K + benefits

Strong programming skills in C or C++ and Windows NT are pre-requisites for these positions. Experience in some of the following areas is also required: Windows 3.1/95, Windows NT, Windows SDK, MSC 7.0, MFC, Visual Basic, Visual C++ and Microsoft NT. Also desirable are Windows XVT libraries or networking skills.

REF: SC/08/EXE

### SOFTWARE ENGINEERS-SENIOR SOFTWARE ENGINEERS

Various Client/End Users, Software Vendors and Software Houses dedicated to strategic implementations 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, Windows NT (SDK, NT or X-Windows and Toolkits), Networking and Communications with companies offering technology based careers and management responsibility.

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

£12-£25K + benefits

REF: SC/09/EXE

VISUAL BASIC SKILLS MUCH IN DEMAND - PLEASE CALL TO DISCUSS REF: SC/10/EXE

HANTS/LONDON - VIRTUAL REALITY DEVELOPERS - MFC, C++ - to £35K REF: SC/11/EXE

LONDON COMMS SPEC X25, X400 £40-60k REF: SC/12/EXE

C, C++/MFC - Countrywide REF: SC/13/EXE



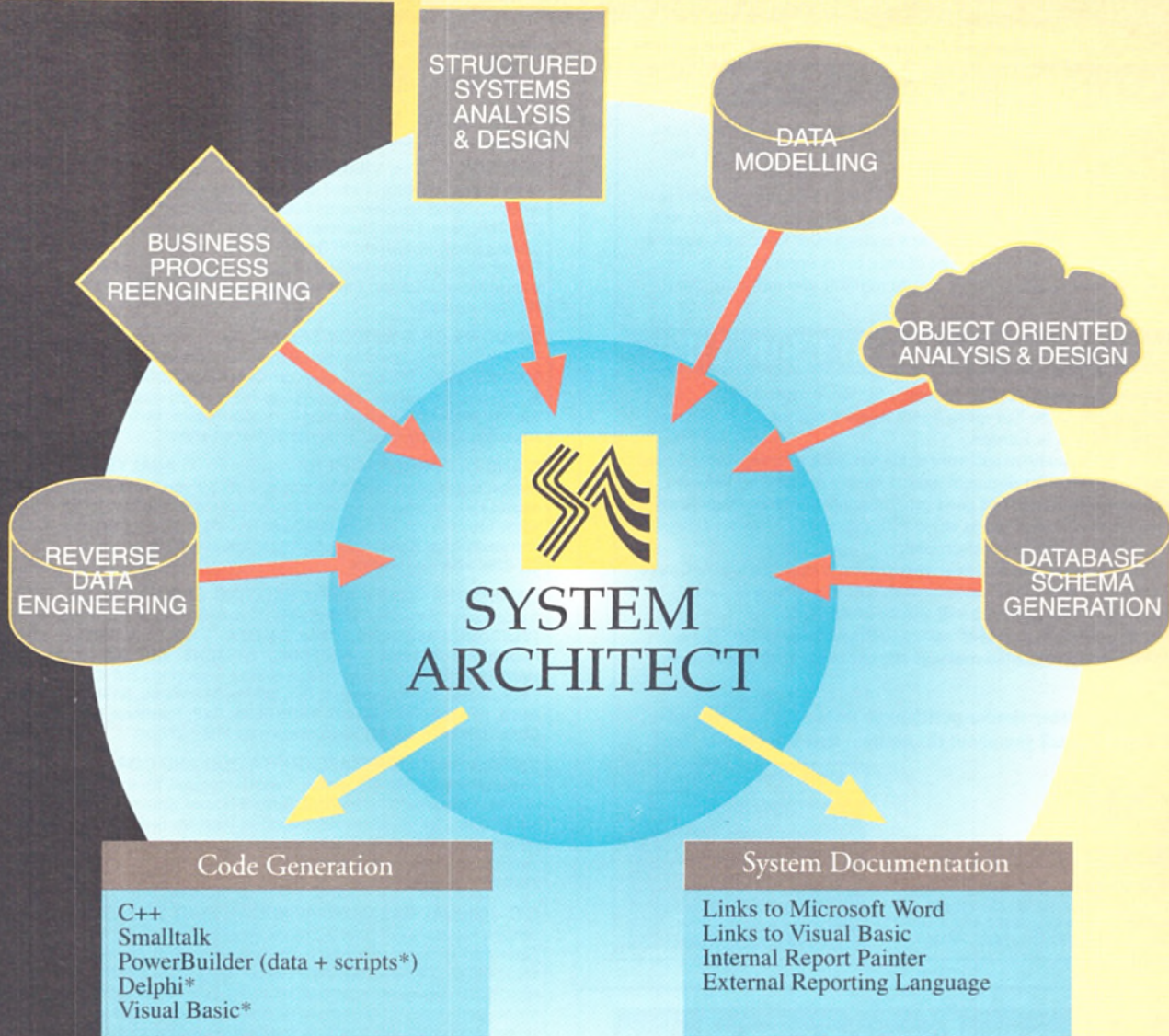
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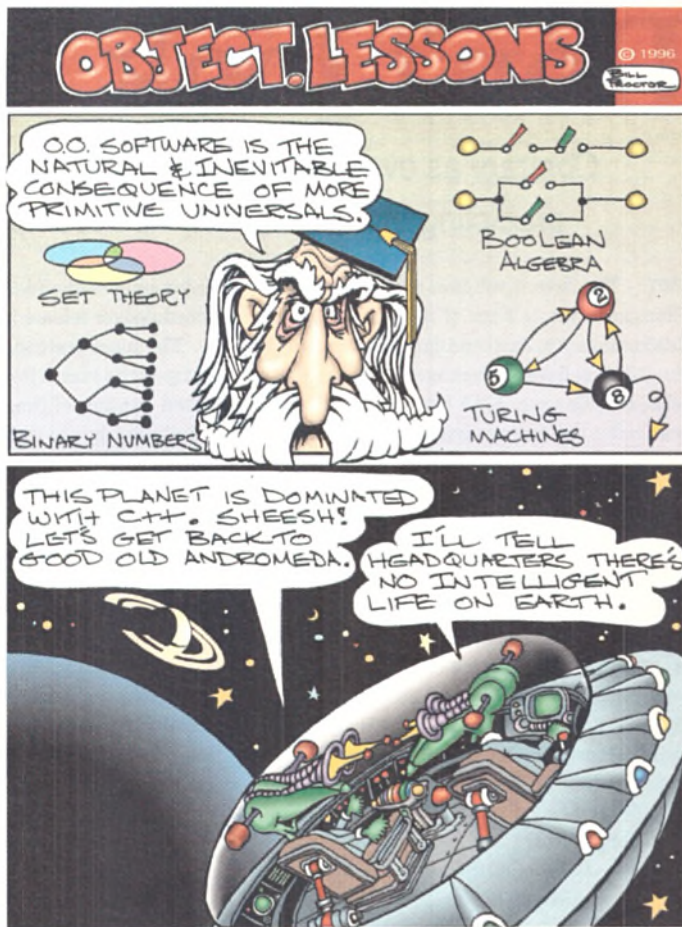


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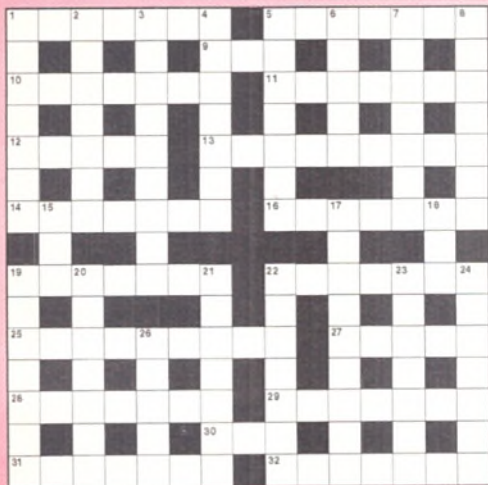


## A software is a software is a software

When Ctrl-Brk scoured the net, we were interested to find how the perception of software differences can vary widely. We read on the O'Reilly Web site ([http://software.ora.com/news/ms\\_internet\\_andrews.html](http://software.ora.com/news/ms_internet_andrews.html)) 'We have found that NTS and NTW have identical kernels; in fact, NT is a single operating system with two

modes. Only two registry settings are needed to switch between these two modes in NT 4.0, and only one setting in NT 3.51.' And on the PC Week OnLine site (<http://www.pcweek.com/archive/1337/pcwk0123.htm>): 'But officials at Microsoft, in Redmond, Wash., responded that, upon boot-up, the Registry entries triggered a series of changes - 48 in the kernel and 700 elsewhere - that tune NT to be a workstation or a server.'

## CROSSWORD



### ACROSS

1. Getting data off the M4... (7)
5. ... and what to do first? Just ask! (7)
9. Age in the once wonderful industry (3)
10. Got from George - what an operator! (7)
11. Most neat, like seventh Heaven? (7)
12. Complete with @sum... (5)
13. Not needed, feeling like a spare part even (9)
14. Sadly, so sadly little firm makes standard group (7)
16. Input units in 1 ac (7)
19. Van-crossing information technology (7)
22. Protein in the book with a space (7)
25. Tiny bit of clothing for an early loader (9)
27. Inklings of ideas that spread disease (5)
28. Accesses to a table of addresses (7)
29. Most harmful, it hides signals round the award (7)
30. Just a bit from the last address (3)
31. To do with soccer teams, it lives in (7)
32. Hair dresser concerned with pretty programming? (7)

### DOWN

1. Automaton-like automaton with a chop (7)
2. Gave up entirely (7)
3. They have grand ones about a linear array (9)
4. Such wide knowledge from basis of inheritance to slowing musically (7)
5. Cryptic performer (7)
6. Veggie paste from the hunt (5)

7. Repeatedly go over information technology with original fee scale (7)
8. One way US provides what people leave in the end (7)
15. Harmful if you stick it in in two arguments (3)
17. Such uncertainty for the processor that it 2 (9)
18. Regret the French way (3)
19. Array'd in splendour, well 2D (7)
20. A sour little moment can become loving (7)
21. Forces from arguments, say (7)
22. Hangs on at the end (7)
23. Italian IT man (7)
24. Born with the smell of sodium (7)
26. Healthy multimedia output (5)

### SOLUTION TO OCTOBER'S CROSSWORD

ACROSS: 1. PROCESS 5. CURRENT 9. OPERATE  
10. ACADEME 11. TILDE 12. CONSTRUCT  
13. ROYALTIES 16. NIECE 17. BLURB  
19. GUIDELINE 22. RADIATION 24. POINT  
25. ORIFICE 26. INQUIRE 27. ENGINES  
28. TRELLIS  
DOWN: 1. PLOTTER 2. OVERLAY 3. ERASE  
4. SKETCHING 5. CHAIN 6. REACTANCE  
7. EXECUTE 8. THEATRE 14. LIBRARIAN  
15. SCIENTIST 17. BARCODE 18. UNDOING  
20. INITIAL 21. ESTEEMS 23. IDEAS 24. PIQUE



# Don't look back

Contrary as ever, Ms Stob marks *EXE*'s first decade by predicting the events that will accompany its second.

**1997** – The Java revolution continues. Foyles allocates a whole floor of its Charing Cross Road premises to Java and Javascript books. Of the 2300 software packages and products released this year, 1245 have names derived from coffee or beverage drinking of some kind.

However, one crack appears in the facade. While watching a demonstration of a new Java application at the JavaTwo conference in June, a small boy is heard to cry 'But it's so *slow*!'. He is hastily carried out.

The *Observer* newspaper follows up its intelligent and campaigning 1996 Internet coverage with an article about CERN research centre, where the World Wide Web was invented. Since most pornographic material is carried by the HTTP protocol, the *Observer* argues, CERN should be held at least partially responsible for its widespread availability. The article is headlined 'Ring of Filth'.

**1998** – Corel is in the news again with its surprise acquisition of Novell, which has been ailing badly under the onslaught by NT. Corel-Novell publishes a new open networking standard that it is claimed will enable cheap and useful integration of embedded processors, such as those found in cars, toasters and industrial plant. Microsoft endorses the standard and implements its own version of it, including proprietary extensions which only work with Visual Basic.

Borland alarms and puzzles industry pundits by making a profit for six consecutive quarters.

**1999** – Security continues to be a big issue. An independent consultant based in Redmond, Washington claims to have found a hole in Netscape Navigator by which applets are able to determine and broadcast back to a Webmaster the colour of a Web surfer's knickers. Netscape's stock plunges, and in September the company is acquired by Corel for a song. Corel sorts out JavaScript, and in recognition of the fading glamour of the word 'Java', renames the scripting language 'Malcolm'. Microsoft announces that it will implement the new language with its own inevitable proprietary extensions – these will be known as 'MalcolmX'.

Microsoft also announces two new versions of Windows that will succeed NT 4.1 and '97. Following the company's tradition of using city names for future Windows releases, these are

codenamed Eldorado and Atlantis. They are scheduled for release in spring of 2000.

The most fashionable programming language of the year is Roughtalk, a non object oriented version of Smalltalk. RT's success is attributed by its designers to the fact that '...computing isn't about objects; it's about getting out there and doing things! By stripping out the object framework, we allow the programmer/designer to concentrate on function, and, incidentally, improve the performance of the compiled code.'

**2000** – The oft-predicted century rollover disaster is something of a damp squib. Great excitement when a woman living in Southsea receives a bill for £32,767, but this turns out to be ordinary post-privatisation utility aggressive market practice rather than any computing error. However, Jeremiahs are cheered up when on February 29th the clearing banks' ATM networks go down. It is subsequently established the cause is a bit of PL/1 written by a NatWest programmer in 1978 who, in order to shoehorn his calculation of leap years into 3 KB, applied the divisible-by-four and not-divisible-by-100 rules, but not the divisible-by-400 rule. (Technical detail provided to please those who have coded date routines.)

In September, a world-wide shortage of RAM causes the price to rocket past the \$3/MB mark. Microsoft denies rumours that the still unreleased 3D versions of Windows – now renamed 'My Happy Workspace' and 'My Happy Playspace' – will require at least 2GB per workstation to run.

The Free Software Foundation releases an RDBMS called Freeziquel. The product is pooh-poohed by the commercial database vendors, who predict that no company will entrust its data to a system that isn't outrageously expensive for all it is. Freeziquel downloads from the Net are brisk.

**2001** – A vast legal battle rages all year over who has the trademark rights to the name 'HAL' to describe a computer product. The protagonists completely fail to notice that nobody else gives a damn.

All flavours of UNIX finally converge; on the Linux standard.

**2002** – 'My Playspace', as it is now called, is finally launched with a 4GB VFRAM (Very Fast RAM) requirement and a furore of publicity. Stunts include painting Wales yellow (the official Playspace colour) and a misguided and unsuccessful attempt to bring the Rolling Stones back to life. Sales are steady, despite a draconian copy protection scheme which requires the purchaser to have a serial number laser-branded onto the back of his retina.

My Playspace incorporates not only a word-processor, spreadsheet, drawing package, games, financial and tax calculation applications, virtual reality suite, air traffic control etc, but is also supplied with a 'free' Microsoft PC, desk and chair. Unlikely bedfellows Compaq and Ikea press for action from the anti-trust people, but without success.

A hacker breaks into the Pentagon and changes all the internal codes, so that the US is unable to fire off its missiles. He is caught and charged with maliciously preventing nuclear war.

**2003** – Corel acquires the ailing Oracle-Sybase.

Several companies announce products based on speech and smell recognition, claiming that these technologies have finally matured. As usual, it soon becomes painfully obvious that they have not, but not before Microsoft has announced new DirectSpeech and DirectSmell recognition APIs for Playspace.

**2004** – Following the reintroduction of the death sentence for software piracy in several mid-West states of the US, the Free Software Foundation announces that it has developed a My Play-

space compatible product. It is promptly obliged to flee into hiding pursued by an army of lawyers.

**2005** – With the IT sector no longer growing at the huge rates of former times, thousands of programmers are out of work. There is a knock-on effect; other businesses in the dumps include the manufacturers of CD-ROM cases, T-shirt printers and Pizza Express.

New industries have moved into the limelight, and terrible indignities are inflicted on former software giants. Corel is bought out by Geno, a firm of genetic engineers which specialises in household pets (its first and runaway success 'killer' product being a dog genetically engineered not to smell its own private parts).

*Wired* Magazine publishes its first ever comprehensible editorial.

**2006** – At the East Kilbride offices of a chemical conglomerate, a junior executive is fired for buying Microsoft. ■







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## HASP Packs More Into Less.

Based on a full-custom ASIC utilizing 2500-gate, 1.5-micron E<sup>2</sup> technology, HASP packs the most advanced protection into the smallest key in the world.

# HASP<sup>®</sup> PROTECTS MORE.

## NSTL Study Rates HASP No. 1!



A recent test conducted by the National Software Testing Labs, the world's foremost independent lab, compared the flagship products of leading software protection vendors.\* The result? HASP was rated the clear overall winner - and number one in all the major comparison categories.

### NSTL TEST RESULTS, OCTOBER 1995<sup>†</sup>

Scoring Category	Aladdin HASP	Rainbow Sentinel
Security	9.3	6.3
Ease of Learning	9.1	7.1
Ease of Use	8.3	7.2
Versatility/Features	10	8.7
Compatibility	6.7	6.5
Speed of API Calls	0.9	1.2
<b>Final Score</b>	<b>8.5</b>	<b>6.5</b>

<sup>†</sup>For a full copy of the NSTL report, contact your local HASP distributor.

These days, more and more developers are choosing to protect their software against piracy. They're protecting more products, on more platforms, with better protection – and selling more as a result.

And more of these developers are protecting with HASP. Why? Because HASP offers more security, more reliability and more features than any other product on the market.

HASP supports the most advanced platforms, including all Windows 32/16-bit environments, OS/2, DOS, Mac, Power Mac, NEC, UNIX and LANs.

To learn more about how you can protect better – and sell more – call now to order your HASP Developer's Kit.

## Grow With Aladdin!

The fastest growing company in the industry, with over 4 million keys sold to 20 thousand developers worldwide, Aladdin is setting the standard for software security today.



**01753 622266**  
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**ALADDIN**

*The Professional's Choice*

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- Learn OO technology at your own pace, and scale up to meet the sophisticated needs of large-project teams in a business enterprise
- Create applications in a fraction of the time normally required
- Improve your company's competitive posture and I/S relations with users by responding faster to changes
- Use your existing assets, such as code, data, business process models or programming skills, to enter the visual age of OO program development

## A more powerful visual tool

- Multiple platform support for both development and execution of applications on IBM OS/2\*, AIX\*, and Microsoft\*Windows\*
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