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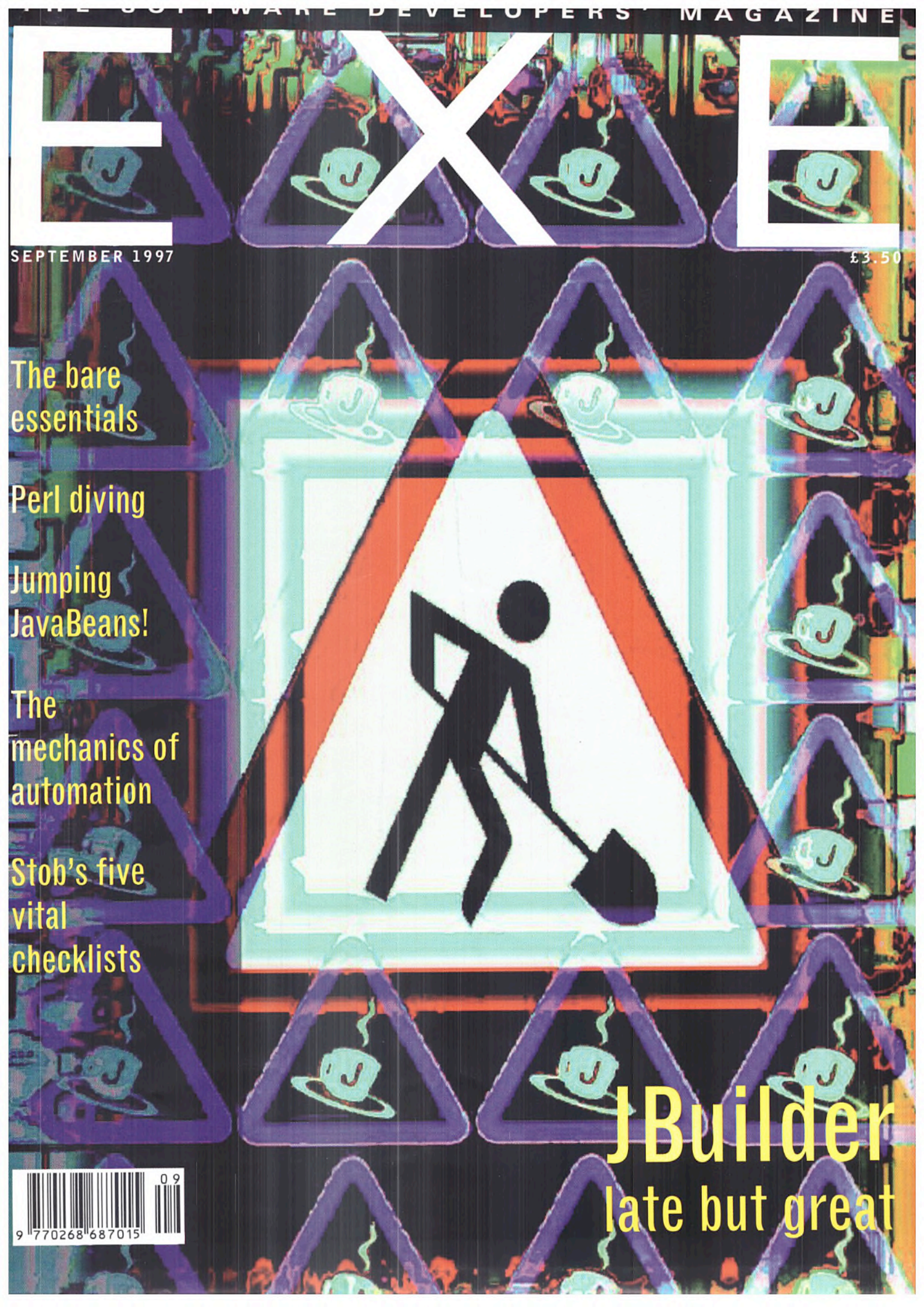

The bare essentials

Perl diving

Jumping JavaBeans!

The mechanics of automation

Stob's five vital checklists

JBuilder

late but great

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INSIGHT

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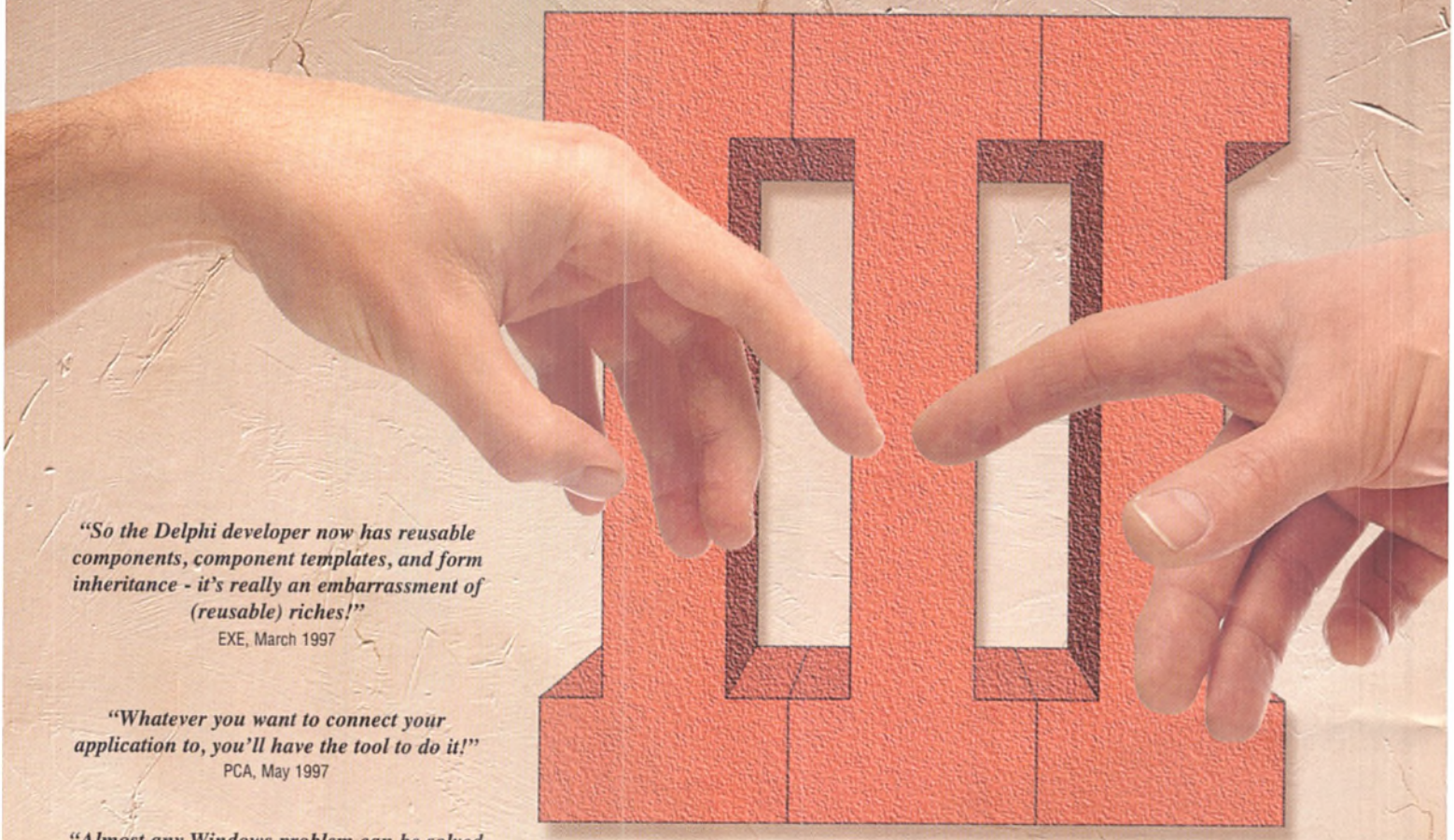

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EXE, March 1997

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PCA, May 1997

"Almost any Windows problem can be solved without resorting to another language. The development environment is itself built in Delphi, showing its flexibility."
PC Week, 4th March 1997

"Has the best got even better? In my opinion it certainly has!"
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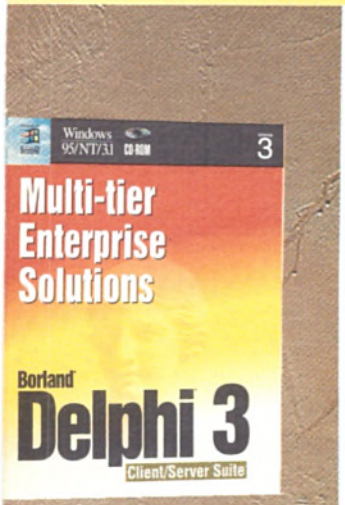

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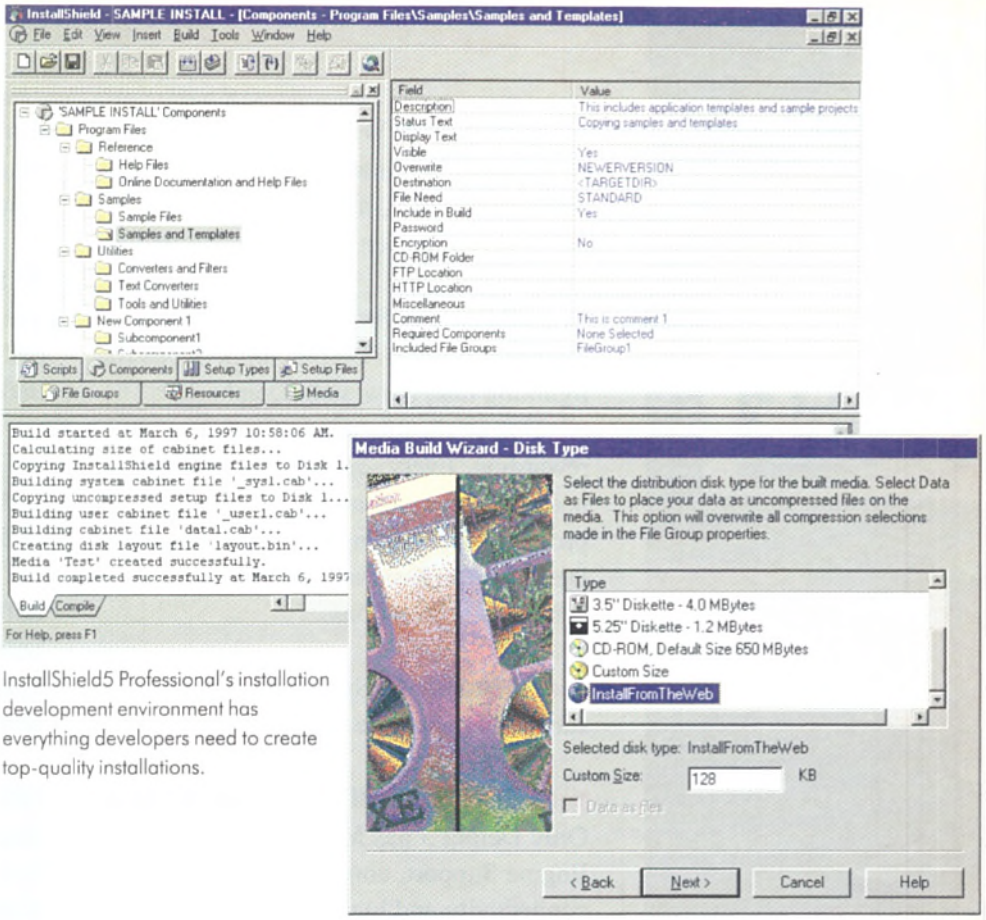

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ENQUIRY NO. S9

Delphi and the Help File

I think it was a Lancia Beta. Somewhere in the 1970s there lived a man, a lover of Italian cars for their grace and speed, who bought a new coupé which rusted to death in about 18 months of ordinary use. So he drove its flaking, rotten hulk to a car park outside Lancia UK headquarters in Croydon or wherever, and dumped it there, and then told the newspapers. There was a massive hullabaloo, and I think the bloke even got a message of sympathy from Prince Charles of all people, and Lancia's UK sales dropped like an incautious foot through a dodgey sill.

Borland UK's headquarters are in Twyford, and just as soon as I can find a car park on my map of Berkshire, I'm off to ditch this brown paper bag. It is filled with Delphi help files.

Now don't get me wrong about this. If you haven't heard the news about Delphi, I should make it clear that it is the fastest, cleanest, *funnest* development tool around – full of power and grace and versatility and clever bits. It knocks the best efforts of the 'Redmond, Washington State Headquartered One' into a cocked hat (a point implicitly acknowledged when a recent version of Visual C++ shipped with a Delphi-written utility). No, I am specifically moaning about the documentation supplied with Delphi, which was always poor and has got worse and worse with each successive release, and is now really CRAP.

I am specifically moaning about the documentation supplied with Delphi

Delphi 1's help was annoying because the help file simply didn't cover all the detail of the Delphi library, and was organised in such a way that you could never find anything. Want to invoke WinHelp the official Delphi way? There's a method in TApplication to do this, but you'd be most unlikely to find it. Want to open a CSV text file? Not documented in Help files at all – you had to know about, and somehow get hold of, Borland's 'TI' files for Delphi. A lot of features are documented only in TI files. A lot more are documented only by the source code.

Delphi 2 ditched a Pascal-specific Windows API description for a dreadful, unnavigable file with no ascertainable structure and all the code references in C. The excuse given for this was that it was a 'Microsoft supplied the file', but in version 1 Borland had invested the resource to sort out Microsoft-supplied material, so this doesn't really wash. Version 2 also heralded the multiple broken links feature, whereby you click on a cross-reference and get told to 'Apply to your Vendor for a replacement file', but with Version 3, the current version, they really let this rip.

Also new for Delphi 3: lots of pages containing function lists *removed* – hey kids, try finding those useful lists of Pascal string and PChar string functions in Delphi 3 help – and code examples *removed*. This for stuff that is still current and useful. I mean, *why?*

There is also the phenomenon of 'shy help'. Present since Delphi 1, this must be familiar to every Delphi developer on the planet. The help window will suddenly send itself to the back for no reason.

And lots more things. It must surely be a matter for shame for the denizens of Scotts Valley that Visual C++ has online documentation that runs rings around Delphi's. Even Visual C++ 5, where the help system is crippled by Microsoft's strategic decision to write it in HTML.

One must conclude that Borland just doesn't take Delphi help seriously. When I found myself using Delphi 3 with the Delphi 2 help file pegged open so that I could find all the missing stuff, I cracked, and packed my brown paper bag and got out my Ordnance Survey map of Berkshire car parks. I'll just...

One moment. One moment. A voice in my headphones – it is Borland UK's inestimable Jeremy McGee, whispering that an 'inline upgrade, Delphi 3.01, will be out in a couple of weeks, and that this will fix everything and make everything lovely'. Hmm, I find this hard to believe, but since it is Jeremy...

Very well Borland – you can have one more chance. But it's only fair to warn you that we are keeping Prince Charles on amber alert.

Will Watts

The Web or how to get buggy software

'Remember how exciting these Net upgrades used to be?' This appeared in Need to Know *(http://www.spesh.com/ntk)* when commenting about the availability of the beta of FrontPage 98, the final version of Netcaster and DirectX 5.0. I do, and I even remember before the Web when software was sent on CD-ROM and before that on floppy disks (3"1/2, 5"1/4 and vaguely the time of the 8"). Back then the difference between alpha, beta and final versions was clear. Commercial software meant final.

Today, you can buy some beta versions, often called Previews just to muddle things further. Instead of hiring staff to release software with no known bugs many (if not most) companies rely on wide Web distribution of early code to find bugs. Versions 1.0 are as transient as the pre-final ones, a Web year later – ie 3 months later at most – there's an update and so on.

End-users are always at least a few versions late when they're lucky, or if they have an Internet connection often have a non-working computer. Developers are working with (too) many betas and have to maintain compatibility with the version of the day. They spend too much time downloading betas, and then looking for patches. Maybe if the source of commercial applications was available to read, software houses would be more careful as to what they release as their reputation might depend on it.

David Mery

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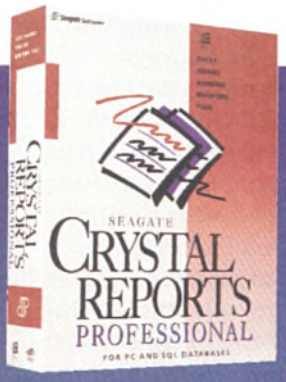

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Apple and Microsoft bury the hatchet and tie the knot

Apple last month dumped most of its existing board and appointed new directors including Oracle chairman Larry Ellison, then went on to conclude a far-reaching deal with former arch-enemy Microsoft. The deal sees Microsoft buying $150 million worth of non-voting Apple stock (which it can't sell for three years), but more importantly for developers, hints at a broad range of co-operation between the two companies across operating systems and applications.

One immediate result of the deal was a final end to the infamous 'look-and-feel' feud between the companies which saw Apple taking Microsoft to court on numerous occasions alleging that Windows was too close to the Mac OS and therefore infringed Apple's copyright. Despite the years of effort, the threat didn't seem to be that strong as Microsoft eventually released Windows 95 with an even more Mac-like interface than preceding versions. Apple also announced that Internet Explorer would be supplied as the default browser for the Mac from now on.

Other likely effects of the deal will be continued support for Macintosh development in Microsoft's applications and closer co-operation on Java. This may well throw a spanner into the works of Apple's membership of the '100% pure Java' movement, especially as the company will be developing a similar technology to Microsoft's J/Direct which gives native access from Java code to operating system APIs in clear contravention of Sun's guidelines. No mention has been made about whether Microsoft will have any input into Apple's next-generation Rhapsody OS.

The deal could be interpreted as good news by Mac developers, as Microsoft is the single largest developer of products for Macintosh and its continued support should keep that market going. At the same time, Apple has so far refused to clarify its position regarding licences to clone manufacturers. If it puts them out of business the market size will be limited to Apple's production. One has to remember that Motorola which is manufacturing the PowerPC chips present in Apple computers is one of the clone companies.

w http://www.apple.com
w http://www.microsoft.com

NuMega puts it all together

The latest initiative from debugging specialists NuMega to complement Microsoft's Visual Studio package is an all-in-one debugging tools package; the enthusiastically-named NuMega DevPartner Studio. Supplied tools include SmartCheck, BoundsChecker Visual C++ edition, CodeReview and FailSafe for Visual Basic, and SoftICE for Windows 95/NT. Additional tools are in development for Visual J++, Visual C++ and Visual Basic which will be incorporated into DevPartner Studio when available.

A subscription program – SmartSubscription – has been created for the package, and customers taking this option will receive all updates automatically.

Integrating ancillary tools into Visual Studio seems to be the flavour of the month; Rational and PureAtria (now merged) have integrated tools in the same markets as NuMega, so expect further developments in this area soon.

w http://www.numega.com

Beans means... Glasgow?

As JavaBeans begins to take off as a component model, Sun has been quick to release tools which let developers move from the 'proprietary' ActiveX to the 'open' JavaBeans model. First up is the JavaBeans Migration Assistant for ActiveX, developed with the help of IBM's Taligent division. Tt is claimed to converts ActiveX controls to JavaBeans components. It works by extracting the ActiveX information available in the registry or a disk file in order to create a set of methods, properties and enums that an equivalent Bean would implement to achieve the same function. Data types are mapped from Windows-specific types to their equivalent Java types. You need the source of the ActiveX control to use it. For more information check the Sun Web site.

The JavaBeans Bridge for ActiveX is a COM wrapper for JavaBeans. A bean so wrapped looks like a native ActiveX control to any COM container application. Although Microsoft includes a COM wrapper with its Visual J++ development environment, this only wraps Java classes and applets, not beans.

InfoBus is a messaging technology which permits two-way communication between JavaBeans. It was developed jointly with Lotus. A developer blueprint for InfoBus, as well as a beta of the JavaBeans Bridge, are available on the Sun Web site.

At the same time as these technologies were announced, Sun posted the specification for the next version of JavaBeans for public review. Oddly enough, this has been code-named 'Glasgow'. Whether this will be the first of a series of product codenames taken from Scottish cities has yet to be established, but if so, expect JDK 2.0 (codename Auchtermuchtie) soon!

w http://java.sun.com/beans
w http://www.lotus.com
w http://www.taligent.com

Speed Ferret for VB5 is a search and replace tool which works across VB5 projects and can search and replace not only **source code**, but **object properties** as well. The results report is **customisable** according to user requirement, and multi-level undo is provided.
00 1 814 345 5657.
http://www.moshannon.com

Adding **TCP/IP** to your application is simple with **Dart Communications Internet Toolkit** version 3.0. This set of controls for VB, Visual C++ Delphi and PowerBuilder **encapsulates** a variety of common **protocols** including FTP, Telnet, SMTP, POP3, WHOIS and Finger.
http://www.componentsource.com

The **Java Performance Runtime** for Windows is a new version of Sun's **JVM** for Windows plus a new JIT compiler which Sun claims is **optimised** for JDK 1.1 and **outperforms** its rivals. The Runtime is available for download at *http://www.sun.com*.

It's a busy month at Sun. **JavaCard 2.0** is a specification for Java-based **smart card** applications. The idea is to produce a write-once, read anywhere standard for smart cards regardless of the **hardware design** used. The specification will be available on the Sun Web site later this month.

Informix developers may want to get their hands on the **Informix Partner** Companion **CD**, containing **trial versions** of Informix-compatible development tools including Build-IT from Wallop Software, Seagate Crystal Info, NetObjects Fusion, HAHTSite 2.0, and Bluestone's Sapphire/Web.
http://www.informix.com

Siemens Nixdorf is to develop a '**geospatial**' DataBlade for Universal Server. This blade will allow the storage and manipulation of **GIS** data including **terrain** maps, **satellite** images, and **statistical** information within Universal Server.
http://www.informix.com

Want to test your **programming skills** on the **world** stage? Then enter the Developers Competition 97, a US version of the UK's RAD Race. This year there is a separate category for **Internet applications** and, as always, a **charitable organisation** will be the beneficiary. 00 1 800 677 3542

Rogue Wave's **Standard C++ Library** and **Tools.h++** are to be incorporated into Rational's **Apex C++** development environment. Versions of DBTools.h++, Threads.h++ and Money.h++ will be offered as well, and **visual models** for each will be available.
http://www.rational.com

Users of **InterSolv's Excelerator II** design tool should note that with immediate effect the product has been transferred to **Select Software**. All sales and support enquiries should in future be addressed to Select, not InterSolv.
http://www.select-st.com

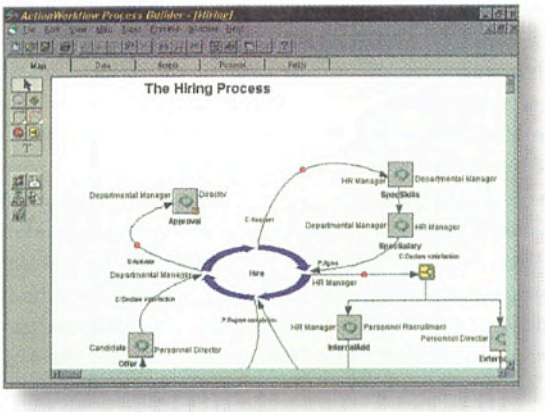
Sun's attempt to become a **Publicly Available Specification** submitter, which would allow it to propose an international standard for Java, has been rejected by the **UK's ISO committee**. The 'no, with comments' vote allows Sun to make changes to its proposal in time for the next **international committee** vote – at which time it expects to carry the day.

RAC not RAD 'is the way forward'

It seems like only yesterday when everyTom, Dick and Bill were telling developers that RAD was the wave of the future; certainly there have been enough RAD tools released to make a small mountain. Enterprise application development specialist Cincom would like to change all that: version 2.0 of its Total Framework system has been dubbed a RAC (Rapid Application Customisation) environment.

The idea is that changes to the the program specification can be quickly assimilated regardless of how far the project has already gone. To achieve this, Total Framework uses the familiar tactic of storing business logic, code objects and workflow information in a repository.

Version 2.0 supports direct coding in multiple languages. At the time of writing, only Smalltalk was available, but interfaces for Java, C++ and Visual Basic are under development. Existing Cincom products use Smalltalk so it was essential to have support for it out of the box.



Among the new features in version 2.0 is – naturally – Internet/Intranet enhancements which using an IIOP ORB will Web-enable any Total Framework application. Read/write access to data servers including VSAM, iMS, Oracle, Sybase, Informix and DB/2 is supported. The workflow tools – previously existing as a separate tier – are integrated into the main IDE. Additional supplied components and frameworks include distributed communications, process logic and persistent objects. UniSQL Server 3.5.3 and ObjectStudio 5.1 are bundled in the box.

Although Cincom admits that Total Framework is aimed primarily at enterprise application development, the package will be available in a variety of versions to suit the needs of both small and large development teams. No pricing information was available at the time of writing.
t 01628 524108
w http://www.cincom.com

Going native with Apple

The latest implementation of Apple's JVM for Mac, MacOS Runtime for Java (MRJ) 1.5, is available. New features in this release include a PowerPC native JIT compiler, and claimed significant performance increases.

For developers, MRJ 1.5 includes Apple's MRJ Toolkit, the promised native code interface for Java. Applets written with the Toolkit can call MacOS functions for native performance and look-and-feel. The stub code, however, will detect if the applet is not running on MacOS and substitute an appropriate Java call instead.

MRJ 1.5 is not JDK 1.1 compliant: it is built to JDK 1.0.2. MRJ 2.0, due later this year, will be based on JDK 1.1.

Get MRJ 1.5 and the MRJ Toolkit on the Apple Web site.
w http://www.apple.com

Java embeds itself in lots of places

The 100% pure Java bandwagon rolls on to pastures new with the announcement by Sun of APIs to make Java accessible to disabled users and useful for embedded systems developers. The Java Accessibility API provides a variety of custom output and input options for specialised hardware including braille displays, voice synthesisers, screen magnifiers and speech recognition systems. The API will form part of the JFC (Java Foundation Classes), scheduled to be included with the next JDK revision later this year.

At the same time Sun has developed the PersonalJava and EmbeddedJava API sets for small devices including PDAs, mobile phones and pagers. PersonalJava is for devices with rich display capabilities but limited input – such as phones or pen-operated devices – and EmbeddedJava is for devices with low-resolution LCD or non-graphical displays including low-end phones and pagers.

In a related announcement, WindRiver Systems revealed that its Tornado embedded development system will support both new Java APIs immediately on the VxWorks operating system.

Another twist on the embedded Java scene came recently when UK palmtop makers Psion announced that it would be implementing a Java virtual machine to run on top of its EPOC32 multitasking operating system on its recently-released Series 5 machine. As yet, there is no timeframe for this project. No word has been forthcoming as to whether Microsoft will be building Java support into Windows CE.

w http://www.javasoft.com
t WindRiver: 0121 628 1888

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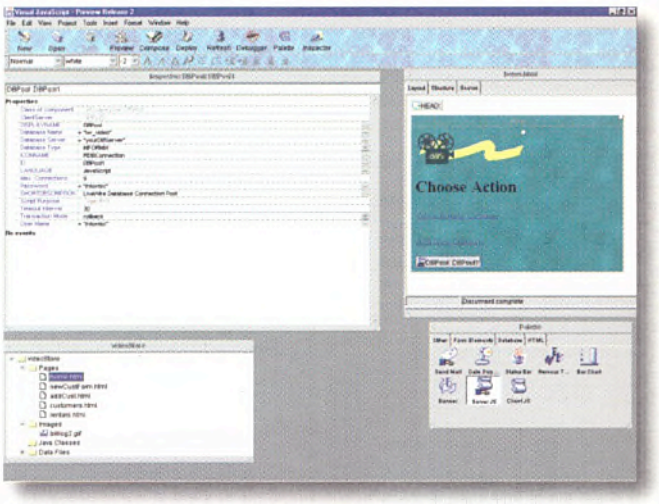
JavaScript made easy by Netscape

Despite being seen by many as little more than a gimmick, JavaScript – which may or may not have been renamed LiveScript again – can be used to build sophisticated Web applications. In programming terms however, it is back in the stone age. Any and all JavaScript code had to be written and designed by hand. Not any more: Netscape has released a preview of Visual JavaScript, nothing less than a visual IDE for developing Web applications with JavaScript.

Visual JavaScript combines the HTML editing engine of the Communicator suite with a comprehensive object inspector, JavaScript debugger, and visual palette system. HTML elements, JavaScript components, and Java applets can be dragged and dropped onto the design window, which is an instance of Netscape Navigator.

The package includes Netscape's LiveWire database connectivity tools so that your JavaScript applications can retrieve and manipulate data from a variety of sources. Script objects can be designed to run on the Web server or the client, and Visual JavaScript will deploy server classes automatically when required.



What is unusual is that Netscape has made comparatively little noise about what could be a revolutionary product; in fact, no-one in the EXE offices had heard about the package at all until one of us stumbled upon a reference on the Web. With all the fuss being made about Java development environments, it's easy to forget that server- and client-side scripting is a viable way to achieve cross-platform application compatibility. Microsoft is apparently developing similarly sophisticated tools for its Active Server Pages scripting technology.

Preview Release 2 of Visual JavaScript is available for download at Netscape's Web site.

w www.netscape.com

Oracle has released version 1.5 of **Developer/2000**, the client/server application development system for Oracle servers. New to version 1.5 is the **Translation Builder**, which handles language localisation issues, and support for Oracle **Web Application Server** 3.0.
www.oracle.com

It had to happen – **BeOS** has been ported to **Intel** processors. At a Developer Conference last month the company showed a **prototype** of the Intel version to attendees, and promised to ship both the Intel version and a version for **PowerPC** machines in **January 1998**.
www.be.com

The second **Platform Preview** release of **Internet Explorer 4.0** is available to download at Microsoft's Web site. Officially this version is still targeted at **developers** – especially those wanting to try out the Dynamic HTML and Channel Definition Format features, both of which are **fully functional**.

Also available at Microsoft is a beta of **FrontPage 98**, the next version of the **Web site development** tool. FrontPage 98 includes support for **direct HTML editing**, Dynamic HTML elements, and **integrated** VBScript and JavaScript **debugging**.
www.microsoft.com

CI Labs, the joint venture set up by the **OpenDoc** companies to develop the standard, is no more. Following decisions by IBM and Apple to **scale back** further development of OpenDoc, and the **failure** to appear of a **Windows** version, it was decided to wind the company up.

The fruits of San Francisco

The first elements of IBM's SanFrancisco Java application frameworks have been released to developers. Initial elements include the San Francisco Foundation and Utilities, and the San Francisco Common Business Objects – which together form the San Francisco Base Software – and the San Francisco General Ledger. These are available on AIX and Windows NT, with AS/400 to follow.

The Common Business Objects contain relatively simple classes including calendar and currency conversion, while the General Ledger contains specialised classes for warehousing, order management, and account management. Other specialised component libraries are under development.

For more information visit the IBM Web site.

w www.ibm.com

SoftDev/WebDev 97

This year's SoftDev/WebDev show – taking place on 12th and 13th November at London's Olympia – will follow a similar format to last year's with an exhibition including the Indian Software Pavilion – showcasing the new programming talent of the subcontinent – and the Visual Basic User Group conference running alongside the show.

The exhibition will be broken up into focused areas, for example ActiveX, Interactive Objects, and RAD. A Developers Career Path section will incorporate seminars on training and job opportunities, and the WebDev Academy, a programme of tutorials and seminars on Internet development, will run alongside the show. There will be keynote addresses from Intel and Netscape.

All these ancillary events are free except for the WebDev Academy which is priced at £235 per session and the VBUG conference, which is organised seperately by VBUG itself.

w www.softinfo.com w www.vbug.co.uk

JavaBeans for novices

IBM's Visual Age WebRunner toolkit includes a Bean Wizard with which IBM claims 'non-experienced programmers can build 100% pure JavaBeans in as little as 90 seconds'. The toolkit developed by Taligent comprises the Migration Assistant Tool for ActiveX to JavaBeans (see the Beans story on p. 9) and a set of frameworks and JavaBeans. Latest in the Visual Age for Java family, the Entreprise Edition should be shipping by the time you read this.

w www.taligent.com w www.software.ibm.com/ad/java

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Back from the Future

Jules charts the onward march of technology, and wonders if we've reached the top of the bell curve.

I like old magazines. I try to keep at least the occasional issue of nearly everything I buy, because magazines tell you a lot about how things are right now. Television lies, books lie, nostalgia is the worst liar of the lot. But, while magazine reviewers might lie (or at least, write reviews which are wildly inaccurate), what they're writing about, and the things that people are advertising and writing letters about; those things truly reflect the age in which they were written. Magazines are little windows on days gone by, and with a little decoding can tell you what life was really like, whether your nostalgia has conned you into believing you've lived through it or not.

Remember, for example, the Tangerine? A Z80 in a tin box; came with an ASCII keyboard adapter as an optional extra. Even the makers admitted it wasn't much, but added 'We all know it's bigger than an Atom!'. What they were referring to, of course, was the fact that a Tangy had a Z80 inside it (the same processor the TRS80 had, and the one which made you a hit at parties), and the Atom shuffled along on its 6502. Back in those days, we didn't argue about who should write protocols. We took cheap shots at other people's processors, and looked forward to the days when there was some standardisation in operating systems. Half a dozen major operating systems would have been quite nice, and some agreement over what RS232 really was would have solved most of the outstanding technical issues.

It doesn't matter how far back you go; the attitudes stand out a mile. Over here I've got a 1922 Scientific American. 'Lindberg crossed the Atlantic on SKF bearings' trumps the advert, despite the fact that history records he did it in an aeroplane. Nowadays Scientific American carries ads for chip companies, genetics labs, and real estate in Asia, but back then, science and progress was represented by engineering, just as in the 60s it was represented by chemicals and the advertising was about plastics. In the '20s, the world was still big, and interesting, and clean, and not at all the claustrophobic and smelly hell it's now represented as by the same advertising. The same issue, for example, even though it followed the Great War (they'd only had one, remember), carried an article about the invention of the gas-powered automatic pistol – can you imagine such a thing today being regarded as a boon to humanity?

The editors of my treasured 1896 Cosmopolitan would have agreed with the Scientists of the 20s. Yes, Cosmopolitan, the very same as today's guide to power suits and divorce attorneys, but which back then was the window on the world for a generation of housebound and voteless wives. Among the ads for doilly-stamping outfits (Store value $1.55, only 15), soap and better-than-soap products, and engines to provide running water, there are dozens of ads for post-bicycling beef drinks, bicycle saddles, and bicycle lamps which won't jar out or explode without provocation (remember, they used carbide in those days, not electric light), and it suddenly occurs to me that few people had ever seen a car, and fewer still could be bothered to try to operate one.

But, surprises are waiting for us in much more recent magazines. New Scientist, a mere twenty years ago, was bubbling with excitement about nanomachines. Not, you understand, the nanomachines of ten years ago, these were little electric motors etched into chips, tiny lenses focussing their world onto tiny film planes, and tiny pumps driving air over the surfaces of immense supersonic wings, and this stuff all actually worked! We knew how to make a clockwork clock a mere hundredth of a millimetre across, and we've forgotten we even knew that. Photo computing – chips based not on electronic elements but on light – was actually working; they had light valves and light switches and non-linear photoprocessing devices operating at gigahertz. More prosaically, they were building cars with almost no wiring; they were removing looms and replacing them with electronic signalling. The engineering and economic advantages were overwhelming; all they were waiting for was chip technology to catch up with the ideas, and every car would have it. Fusion was just around the corner; the engineering had been done, and everyone believed we were twenty years from usable power generation – this time, too cheap to meter, for real!

I guess twenty years ago, they were too ambitious, too flushed with their own ambitions to notice the incompleteness of their successes. Ten years later, had things changed? Here is a 1986 Byte, a special issue on knowledge engineering (remember that?). We were talking about building how and why functions into the deepest levels of computers, and so making computers which didn't need (and couldn't accept) programming. Although AI in general was oversold, these machines really did useful things, and worked with a reliability that exists today only in nostalgia. We were talking about visual grammars, so allowing users to write programs by interactively defining constraints. Computers existed which would watch for repetition in a user's actions, and create a program on the fly for the user, gently taking over his task with a polite 'I understand – see?'.

As I read back through my magazines, I find nothing unfamiliar until I reach the 1970s, then suddenly the depictions of the world I thought I knew become strangely wrong,

as if recalled from a dream. The clean lines of buildings, cars, and furniture shown in the ads were freeing the people in the articles to relate to each other, yet today we've become more insulated and isolated from each other than even the imprisoned women who would have read my Cosmopolitan. Today, when experts are disputing whether men should be *allowed* underwater to any great depth, men walking, driving and golfing on the moon seems like science fiction – if it hadn't actually happened, it would be unthinkable! – yet Lindberg would have believed that such a feat was no more than a better bearing away from his achievement (as, in a sense, it was).

Something incredible is happening; in the last twenty years science, engineering, development – technology in general – is going backwards! Things which we knew how to do, we've forgotten about. Inventions which could have changed the world have been uninvented. The genie is being put back in the bottle. It's all there, in the adverts in the rotting magazines, and those self-same magazines tell us it's never happened before.

For the first time ever, technology is going backwards. What could possibly be worth that? ■

Jules thinks he may be living in Philip K Dick's Counterclockworld, *and if so, looks forward to growing younger again. You can reach him (provided you talk backwards) on 01707 662698, or on cix as jules@cix.co.uk.*

More BeOS blues

We welcome short letters on any subject relevant to software development. Please write to: The Editor, *EXE Magazine*, St. Giles House, 50 Poland Street, London W1V 4AX, or email editorial@dotexe.demon.co.uk

With regards to Duncan Wilcox's reply to my letter in the August issue of EXE I thought I would respond to a few of the things Duncan said.

'COM doesn't require you to recompile sources against updated object interfaces since... you can't actually change interfaces!'

And this is good. People shouldn't be allowed to ever change interfaces, even when programming outside COM. Adding features by changing interfaces leads to horrendous versioning problems. You may not get hit by them much in version 1 of BeOS but I can assure you they will drive you mad in later versions as you have to work out which methods are actually available in the interface you have. COM uses multiple inheritance (MI) to extend objects, which is a much cleaner way to do things and sidesteps the Fragile Base Class (FBC) problem. Be's mistake here is to use plastic interfaces rather than MI.

'With COM you have to create a new interface and explicitly call the old interface for unchanged methods, thereby obtaining an increase in method invocation time as the hierarchy grows. With enough hacking you might obtain a predictable invocation time, but hardly constant, not to speak of low.'

This is completely untrue. There is absolutely NO overhead for having the same method in several interfaces. The `vtable` just contains a pointer to the same method.

'To use Java's object model you have to use Java.'

Also completely untrue. Languages other than Java can produce objects within the Java object model. Anyway, the most important feature of the Java object model is dynamic compilation – a technology which has been used with many other programming languages and which solves the FBC problem (and many other problems) very neatly.

You mention several times how fast BeOS is. This is hardly surprising considering that it is version 1 and has not had to be compatible with anything. Most things are quite fast in their first version. Unfortunately, the poor design of BeOS means it is unlikely that it will stay fast as it fills up with fudges (eg the `Perform` method you mentioned).

'Nobody knows how soon Be will [...] fill the space it has reserved. When this happens, Be will start a new class hierarchy, with old code bound to the old shared library and new code bound to the new one.'

The only thing we can be sure of is that Be will run out of space sooner than it expected. How fast is a BeOS system going to be with several different versions of the same libraries having to run at the same time? How chaotic is interoperability between software relying on these different class hierarchies going to be?

Unfortunately in order to become a usable and future-proof operating system BeOS would need to be completely redesigned, as the poor object model is so deep-rooted. We should look on BeOS as a good lesson for what can be done well (such as the threads) and what can be done badly (such as everything else), but not as an operating system that could ever be useable or maintainable, as your article suggests it is.

Robert Ennals
ennals@aol.com

There is currently a lot of debate regarding COM's supposed superiority (people often confuse marketing skills with technical skills), but the bottom line is that COM doesn't support object-oriented features in the canonical sense, so it's basically not comparable to real object models. Ignoring the fragile base class problem is not solving it. And COM supports inheritance only if you redefine the meaning of the word (or perhaps I should say 'override'?). This may please Microsoft, but again, it's not a solution.

All this might seem like theoretical talk, but the hard facts are that COM doesn't map well to any existing object-oriented language without very thick wrappers such as Microsoft's 60,000 lines of MFC code (which admittedly also wraps other inferior technology).

Things might get better with the recently released Active Template Library, but inheritance in COM is mostly a set of rules, and aggregation essentially a manual technique entirely implemented by user-written code. Be it MFC or another wrapper, what you see when you trace a method invocation with a debugger is copious amounts of expensive calls.

Regarding Java, you'll have to excuse me for not giving enough detail, I was trying to keep it short. I have nothing against dynamic recompilation and Java, though as anyone who has written Java code will know, it's quite immature and implementations on different platforms have different sets of bugs. While I am aware of IBM's NetRexx and the Ada translator that produce bytecode for Java Virtual Machines, BeOS (as I stated) is not a Java OS. BeOS is about raw performance, even at the cost of some (hopefully temporary) architectural inelegance.

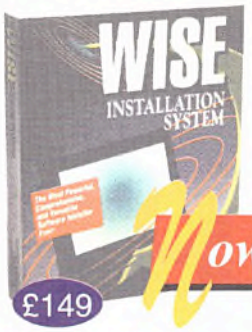
You would be suprised to learn about a number of optimisations that haven't made it into the current version (various aspects in the video driver area and in the application to `app_server` communication come to mind). What you refer to as 'version 1' isn't lacking protected memory like the first Amiga and current MacOS, or overlapping windows like the first Windows or a hierarchical filesystem like the first Microsoft DOS. It's a complete, robust OS.

I already mentioned that a lot of BeOS functionality is in the system servers. There will never be layers of code bloat to slow this architecture down, since a loosely coupled server can be replaced or extensively redesigned without impacting on applications.

What you mistake as poor design is a carefully chosen set of trade-offs that make BeOS the most efficient general purpose OS out there.

BeOS is fast, scalable, and most of all easy to code for. It isn't perfect, but it's not anywhere as bad as your comments suggest.

Duncan Wilcox
duncan@mclink.it



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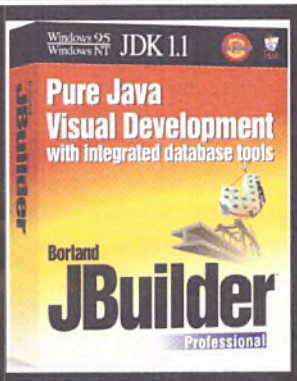

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JBuilder late but great

Java as easy as Delphi? That's a tall order, but Borland thinks it may have the answer. Dave Jewell took the latest JBuilder beta for a spin and now he reveals all.

If every software product had a rating – let's call it the expectancy coefficient – proportional to the delay between its announcement and arrival, then Borland JBuilder would be pretty close to the top of the ladder. (I suspect, though, that Windows itself would take the number one slot.) JBuilder, then called Latté, was first announced back in 1996, and I've got an early field test disk which is dated January 1997. As deadlines slipped, Borland realised that the code-name was proving to be something of a liability – everyone took to joking that Latté should be pronounced 'Late'! Consequently, the name was changed to JBuilder, and that's the way it's been ever since.

In fairness to Borland, much of the delay can be justified by the fact that the rug was pulled out from under them part way through the development cycle. The introduction of Sun's JDK 1.1, the new Java event model and the increasing significance of JavaBeans technology all conspired to present Borland's developers with something of a moving target.

So what exactly is JBuilder, and why should you care? Put simply, JBuilder does for Java what Delphi did for Pascal. JBuilder is a sophisticated, RAD-based IDE which uses the same two-way tools approach pioneered by Delphi. It includes JDBC support, is JavaBeans compliant and contains new BeansExpress technology to simplify the creation of JDK 1.1 compliant JavaBeans components. New beans can then be installed onto JBuilder's component palette, just as you'd install and use a new component within Delphi. Best of all, JBuilder is designed to generate 100% pure Java code which means that you're not locked into Borland's technology. Unlike the company's C++ Builder product, which I wrote about in last April's issue of EXE, the IDE doesn't insert proprietary macros, tags or other constructs into the source code, meaning that your JBuilder source code is easily portable to other development environments.

The version of JBuilder reviewed here is a limited availability beta version. Consequently, you shouldn't assume that anything I say is set in stone as far as the final shrink-wrap is concerned. However, my understanding is that this is a relatively advanced beta, and I don't expect any major changes to the feature set.

Delphi for Java

When you first fire up JBuilder, you experience that same sense of déjà vu that Delphi developers feel when they move across to C++ Builder. This should come as no surprise because, as far as I can tell, quite a bit of the JBuilder IDE code is actually written using 32-bit Delphi (well, why not: if you've got it, flaunt it!), while the rest was built using Java itself. Borland claims that the user interface designer and debugger, for example, are almost entirely written in Java, and I reckon that the same is true of the help system.

Having said that JBuilder reminds me of Delphi, let me quickly point out that there are many aspects of JBuilder's user interface which I consider to be superior to Delphi. Borland has obviously learnt from its experience with Delphi, and has made a number of improvements to the user interface which will doubtless be reflected in a future version of Delphi. For example, I never much liked the fact that you had to grapple with a separate code window and form designer. Rampant 'window-mania' is a feature of most modern IDE's, including Visual Basic and Visual C++. In JBuilder, most of these functions have been integrated into what Borland calls the AppBrowser window (which can be seen in Figures 1 and 2).

In addition to the AppBrowser, you've got a Delphi-style main window which contains the IDE's menu bar, a Component Palette and toolbar. What were VCL components in Delphi are Java Beans in JBuilder and – like Delphi – you can configure the palette, adding and deleting palette pages, renaming them, rearranging them and so forth.

You can use the Component Palette's 'Properties' dialog to add Beans components directly to the palette, assuming that they've been deployed as either `.jar` or `.zip` files. JAR is a new, platform-independent file format which was introduced with JDK 1.1. It allows a Java applet to be bundled with other required components (class files, graphics, etc) into a single compressed JAR which can be efficiently downloaded in a single HTTP transaction. Optionally, different file entries in a JAR file can be digitally signed for authentication purposes. If you want to create Beans for use by other developers, this is how best to ship them.

Adrian van de Plas

You can also add Beans from a designated `.class` file. Unlike Delphi VCL components, Beans do not contain any built-in information about which page of the Component Palette they reside in, so you must specify the palette page to use when installing a Bean.

Most JBuilder activity, however, is organised around the AppBrowser which you'd normally maximise to fill that part of the screen below the main window. The AppBrowser window is bisected vertically. The right hand side of the window is the 'content' pane and displays whatever it is we're looking at while the left-hand pane determines what we're seeing. In this sense, it's an Explorer-style window, but there the similarity ends. Both left and right hand panes have one or more tabs along the bottom edge, not all of which may be visible at the same time. Additionally, the left-hand pane is itself split horizontally into a navigation pane at the top and a structure pane at the bottom. In general, you'll only have one AppBrowser in use at any time, but you can open more by selecting 'New Browser' from the View menu.

Getting to know the AppBrowser

Is this starting to sound a bit complicated? Trust me when I tell you it isn't. It's one of those cases where it's a lot easier to use than it is to explain. Let's start by considering the navigation pane. As its name suggests, it is for navigating around – primarily at the file level. With the Project tab (bottom of the window) active, the navigation pane will be in project-browsing mode, showing the various files in your project in a hierarchical manner, with all the dependent files hanging from the project file.

The dependent files will typically include Java source code, HTML files, text or graphics files. Clicking on any given file will immediately display that file in the right hand content area. If you click the Opened tab, you can see a list of all the files currently open in the IDE, while clicking the Directory tab enables you to use AppBrowser to browse around your hard disk. JBuilder has a list of different file extensions that it knows to be text files, but if wanted, you can add your own custom extensions to this list. If you see a file that's interesting, you can open it, or add it to the current project by simply dragging the file from the navigation pane to either the Project or the Opened tab. It would be nice if the directory browser understood – and could peek inside – ZIP files, and I'd also like the ability to delete files from the browser, but I guess you can't have everything. It would also be deeply wonderful if it understood animated GIFs.

At all times, the content pane changes dynamically according to what's being displayed. If you're looking at a plain-vanilla text file, then you get a simple text editor for viewing and modifying the file. If you're looking at an HTML file, then you normally see the rendered HTML (as you'd see it in a Web browser) but a Source tag appears at the bottom of the window. Select this, and you'll see the 'raw' HTML source. When you're looking at a Java source file, you get Borland's full programming editor, complete with syntax highlighting, the ability to change keyword mappings, and so forth.

As you select different files in the navigation pane, the selected file is represented in the content pane and (if appropriate) in the structure pane. Suppose you click on a Java source file in the navigation window; the content pane will immediately show the contents of that file, while the structure pane will give a 'high-level' view of the file. This hierarchically organised high-level view includes any classes and interfaces in the file, all the methods in each class together with a list of all the member variables. If you want to go to a particular item (be it method, variable or whatever) just click it once in the structure pane, and the content pane will take you there. If you're familiar with Visual C++, you can think of the structure pane as being loosely equivalent to the ClassView window.

In addition to the information previously mentioned, the structure pane lists all the imported packages used by a particular class. If you double-click on a specific package name, that package is opened in the content pane. For instance, double click on `java.awt.button`, and there's the package source code for your perusal. (As with other Java development systems, the source code can be contained within a ZIP file, but can still be accessed directly from the IDE.) To get back to where you were, just click the 'Back' button above the navigation pane; the browser maintains a browse 'history' just like your favourite Web browser.

One of the nicest features (I keep finding more of them all the time!) is the ability to view the structure of `.class` files. When you're in Directory mode, moving the navigation pane into a directory containing one or more compiled class files will cause the IDE to automagically invoke the Java decompiler. As you select each `.class` file, the file structure appears in the structure pane, together with a source

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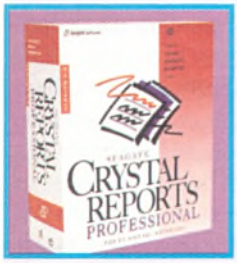

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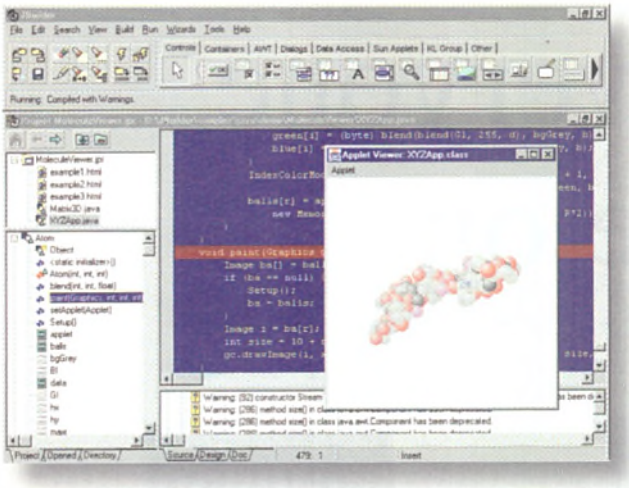

Figure 1 – Here's an overall picture of the JBuilder IDE featuring that old friend of Java developers, the MoleculeViewer applet. At the top is the Component Palette with the AppBrowser on the left, showing the layout of the navigation and structure panes.

Figure 2 – This screenshot shows JBuilder in user-interface design mode. Yet again, the AppBrowser panes have changed to reflect the new context with the Component Tree clearly visible in the structure pane. You can see JBuilder's equivalent of the Delphi/VB Object Inspector.

Figure 3 – Because this is a pure Java development system, there are issues relating to component positioning. However, the Object Inspector gives easy access to the constraints associated with the in-use layout manager.

representation of the file in the content pane. No, it won't decompile the methods for you – perhaps in the next version!

Two-way tools

Borland has always laid a lot of emphasis on the two-way tools approach that it pioneered with Delphi. The idea is that if you, for example, change the name of a component from the Object Inspector, then the name of the component will automatically change in the corresponding code declaration. Similarly, change the name of a component in the code declaration and it should change in the form designer. I've never quite understood why they called them two-way tools because while the former worked, the latter didn't. The Delphi IDE contains the necessary hooks to get in on the act when you make a change via the Object Inspector, but not from the editor window.

Happily, this has been fixed in JBuilder, and the system is much more two-way than it was before. You can now rename methods and member variables in the code editor while watching their names change in the content pane. If you rename the constructor of a class, giving it a new name that's not equal to the class name, you'll see the associated glyph change to indicate that this is no longer a constructor.

When viewing a Java file, the content pane includes a `Doc` tab which provides instant access to the HTML documentation page (if any) associated with a particular source file. JBuilder uses a documentation system called `JavaDoc` which automatically generates HTML-based reference pages from code and comments in the Java source file. An enhanced version of the system, JBDoc, is built into JBuilder. The enhanced system can display information about JavaBeans properties, methods and events, and JBuilder is supplied with documentation pages for all the Javasoft packages, the various Borland JBuilder packages and some third-party packages.

One of the most important tabs in AppBrowser is the Design tab. With this tab active, you'll see a hierarchical view of the UI items in the structure pane, assuming that you've got a Java file selected – Borland refers to this as the Component Tree (Figure 2). At the same time, you'll see what looks like a standard form design window in the content pane and JBuilder's equivalent of the property inspector appears to let you start tweaking properties. As with Delphi and Visual Basic, you select components from the component palette, and then drag an outline of the selected control on the form.

Because we're talking 'pure Java' here, there are various issues relating to component positioning. JBuilder includes a custom layout manager called `XYLayout` which is derived from `java.awt.LayoutManager`. If you use the Application Wizard to create a new application, you'll get a user interface container class which extends `DecoratedFrame`. The frame is automatically filled with a `BevelPanel` component (extends `java.awt.Panel`) which uses the `XYLayout` layout manager. The upshot of this is that you can easily reposition controls in an arbitrary way for prototyping purposes, but Borland stresses that you need to switch to one of the standard layout managers (`GridBagLayout`, `FlowLayout` or whatever) before deployment of your application. Whatever layout manager you choose, you can edit its constraints from the property inspector (see Figure 3).

Menu design is somewhat different to Delphi. Instead of seeing a design-time representation of a menu on the form, the menu (popup or main menu) appears as part of the Component Tree. When you select it, you see a form that contains nothing except the menu (as it would appear at run-time) and you change menu properties by traversing the menu, making alterations as necessary through the Property Inspector window.

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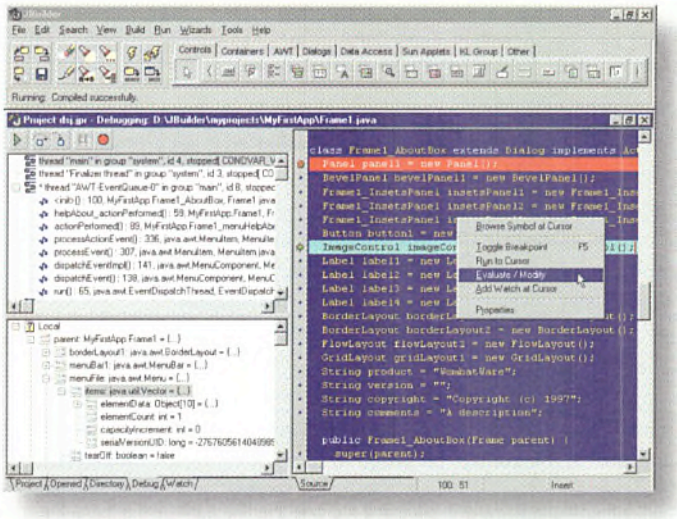


Figure 4 – And here we are again debugging an application. Notice how the AppBrowser is still doing its stuff, but the 'context' of the various panes has changed to reflect a debugging session. In addition to the Evaluate/Modify dialog, you can determine the value of a variable by just holding the mouse over the source.

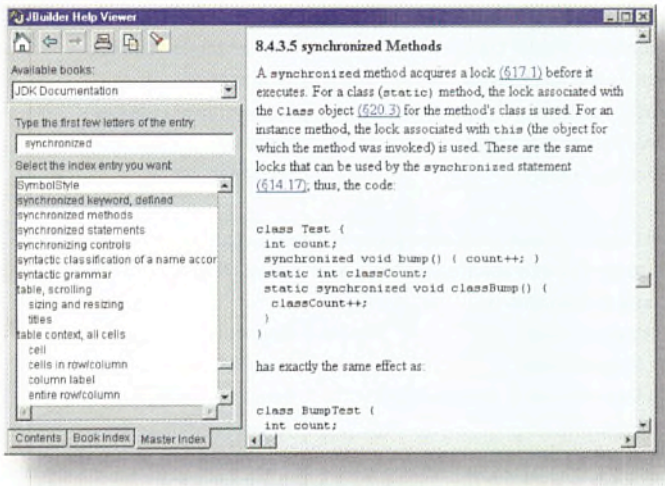


Figure 5 – The Help system is one of the parts of JBuilder that's written in Java. As you can see, it includes a 'master index' facility that combines the indexes for all the electronic books known to the system. To copy help text to the Windows clipboard, you must highlight the text of interest and then click the copy button on the help system toolbar.

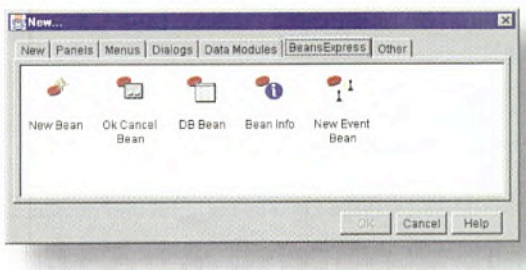


Figure 6 – Here's the Object Gallery, not to be confused with the Component Palette. The Gallery gives access to pre-packaged 'snippets' which allow you to quickly set a few fields and create a new Java class file based on the choices you've made. There's provision for adding your own snippets to the gallery.

Like Delphi, you can set a breakpoint simply by clicking the mouse in the margin to the left of a Java source code line. When the debugger is active, you get two extra tabs added to AppBrowser – Debug for the debugger itself, and Watch for displaying the state of any watched variables (see Figure 4). With the Debug tab active, you'll see a context tree in the navigation pane, and another in the structure pane. By default, the upper context tree displays information relating to what threads are active, and shows line numbers, class names and source file name for every method that's currently on the call stack. You can click one of these methods to move the content pane to that particular piece of code, and – for every method currently active on the call stack – you can examine the state of its variables. It's easy to get back to where you are by just clicking the topmost (most recently called) method on the stack.

As with Borland's other debuggers, you can do all the usual stuff including toggling breakpoints, run to cursor, evaluate/modify and so on. A nice feature of the debugger is its inherently non-modal nature: while debugging, you're still free to use online help, browse other files, and so forth. That said, it has to be admitted that JBuilder isn't *quite* in the same class as the Asymetrix SuperCede system and its cunning use of Flash Compiler's technology. With SuperCede, you can modify your Java program's source code while debugging, and immediately see the change in program behaviour – without recompilation (see *Flash!* In EXE May '97). Being an adventurous sort of chap, I tried modifying the name of a program variable while debugging but as soon as I restarted the program I was politely told that the source had been modified and would I like to rebuild? Oh well, worth a try…

Online documentation

Although this was only a beta, it included a lot of online documentation. You can invoke help by moving the cursor onto an interface or class name, right-clicking and choosing 'Browse Symbol at Cursor' from the resulting context menu (see Figure 5). You can also choose from one of the items on the IDE help menu. In addition to the usual Help Topics, you can select BeansExpress, Java Reference or JBCL Reference. JBCL is the JavaBeans Component Library – you can think of it as the equivalent of Delphi's VCL or the MFC class library.

The online help system appears in a separate window with three tabbed pages, Contents, Book Index and Master Index. This provides access to no less than eleven electronic 'books' including BeansExpress, User's Guide, JBCL Reference, JDK Documentation, Component Writer's Guide, and more. At the time of writing, it's not clear which of these books will be supplied with the product. It also needs to be stressed that JBuilder, like many other development systems, will actually be available in three distinct editions; JBuilder Standard, JBuilder Professional, and JBuilder Client/Server Suite. Presumably, the exact documentation mix will vary according to what edition you buy.

BeansExpress is one of the key new technologies in JBuilder, the aim being to greatly simplify the development of fully JDK 1.1 compliant Beans. JBuilder includes a number of sample Beans to illustrate how its done. To compile a Bean and add it to the Component Palette, you only need to add the relevant Java source file to a project (in order to compile it into a `.class` file) and you can then add the class file directly to the palette, making it available to all other projects. As well as adding Beans to the palette, you can add them to the Object Gallery (see Figure 6). You see this dialog whenever you select New from the File menu. It's an effective way of managing numerous shortcuts which create instances of many types of object.

On the Object Gallery, you'll see a 'Bean Info' item. This is what you use when you want to add a Bean information shell for a designated Bean. This is an additional Java class that's needed to support the interaction between a Bean and a design environment. It's something very much like the property/event/method mechanism in Delphi or Visual Basic and it enables the Object Inspector to hook into any custom programming interface that a particular Bean might support. The Bean Info dialog is an example of what Borland calls a Paste Snippet (see Figure 7). A paste snippet is a dialog box which shows a code template in a scrollable (but non-editable) area. As you fill in the fields at the bottom of the dialog, the code template changes to reflect the choices you've made. Once you're happy, you can click the OK button and the paste snippet will be copied into a new Java file that's automatically added to your project. Paste snippets are also used when adding events to your Bean, and JBuilder provides a mechanism for adding your own paste snippets to the Object Gallery.

Various other wizards and productivity tools are built into JBuilder. In fact, the most commonly used Wizards inhabit an IDE menu all to themselves. Here's a quick Wizard rundown:

- ***Applet Wizard.*** The Applet Wizard creates a new Java class file which extends `Applet`. It creates a new, blank HTML page and embeds the necessary `APPLET` tag into the file so that you can use it to test and debug.

- ***Applet Wrapper Wizard.*** This rather cunning wizard can be used to turn an applet into a Bean. It does this by hiding the applet inside a 'wrapper' class which provides the necessary Bean hooks to the outside world. It provides getter/setter methods for the various applet parameters, exposing them as properties. At the same time, the wrapper fools the applet into thinking that it's living on an HTML page. JBuilder includes a number of Beans which have been created by wrapping Sun applets – including the infamous 'Nervous Text' applet!

- ***Application Wizard.*** I've already alluded to the Application Wizard which creates two files, a start-up class for your application and a user interface class which extends `DecoratedFrame`. Both classes are automatically added to the current project, and if there's no open project, then the Project Wizard is invoked first.

- ***Data Module Wizard.*** This wizard is used to create data modules for modularising your database access code/business rules.

- ***Deployment Wizard.*** The Deployment Wizard bundles together a set of files and packages into a form suitable for distribution. You'd typically use the Deployment Wizard when you want to distribute JavaBeans to other developers or users. The wizard can create either a `.zip` or a `.jar` file, either of which can be optionally compressed. If you create a JAR file, the Deployment Wizard can automatically create a manifest file (list of contents) for you.

- ***Dialog Wizard.*** This wizard does everything necessary to add a new dialog to the current project including: adding a new class that extends from `Dialog`, adding an `XYLayout Panel` to the dialog for use by the user interface designer and setting up a `jbInit` method that handles dialog initialisation code.

JBCL overview

The JBCL (Java Beans Component Library) packages and their various classes are given below. This information is excerpted from the supplied Borland documentation.

control – Contains UI components such as controls, dialogs, and containers, including data-aware, model-view components.

Controls	Text display
Graphics	Containers
Dialogs	

view – Contains views, item painters, and item editors. Used with classes in the control package to form composite components.

Singleton	Vector
Matrix, Grid &Header	Graph &Tree
Views for controls	Text view classes
Item painters	Composite items
Image-item classes	Misc. view classes

model – Contains model interfaces and classes to store data items for composite components, for easy updating of the items shown in UI controls.

Singleton Model classes	Vector Model classes
Matrix Model classes	Graph Model classes
View managers	Item Painter classes
Item Editor classes	Item formatters
Event classes	Iterators

dataset – Contains components for database connectivity. Supports data-aware controls and visual development of database applications.

DataSet types	Row-related
Column-related	DataSet managers
Events, listeners, and adapters	Events for component writers
Descriptors	Aggregate operators
Exceptions	Resolvers
Misc. DataSet classes	

util – Contains utility classes and interfaces, such as interfaces containing groups of constants.

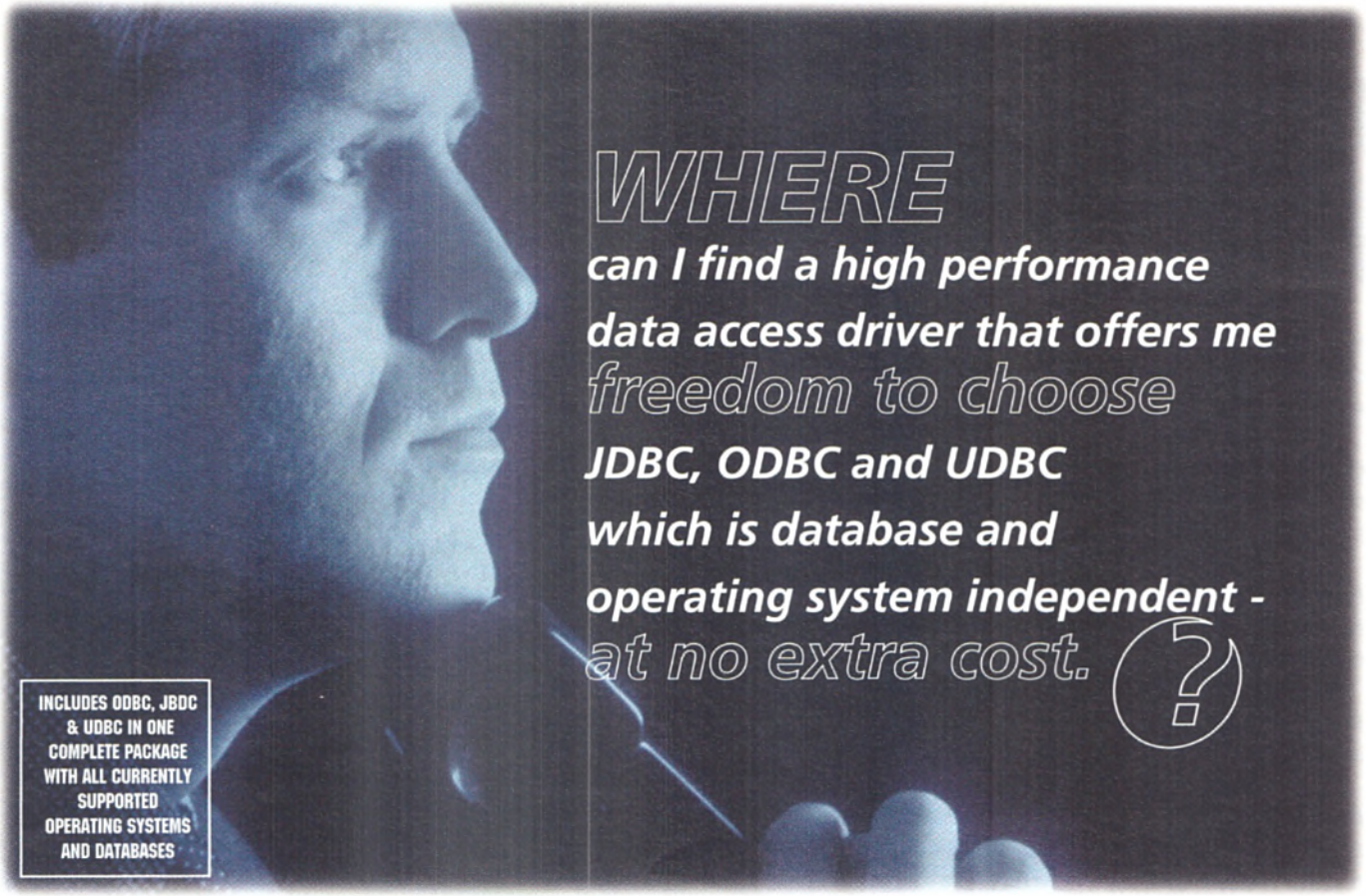
Multicaster classes	Diagnostic classes
Exception-related	Argument processing
Placement-related	Event dispatching
Timer classes	I/O classes
TriState	Variant
Misc. util classes	

layout – Contains layout manager and constraint classes, such as XYLayout for rapid prototyping.

io – Contains specialised stream classes for input and output.

- ***Frame Wizard.*** As for Dialog Wizard but creates a new frame rather than a dialog.

- ***Interface Implementation Wizard.*** This is another one that will



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save you a lot of mucking about. When you run the Interface Implementation Wizard, it displays a list of available interfaces (see Figure 8). When you choose one, it will ensure that the selected Java class implements the selected interface, adding skeletal method calls for every method in the interface. All you have to do is write the 'meat' of the method calls.

- ***New Object Wizard.*** As the name suggests, this creates a new class file taking a package name, wanted class name, what you want to extend from and so forth.
- ***Override Inherited Methods Wizard.*** Controls which methods of the base class are overridden by the current class. As before, you just have to fill in the 'blanks'.
- ***Panel Wizard.*** Adds a new class to the project which extends from `BevelPanel`, doing all the spadework necessary to interface with the user interface designer.
- ***Project Wizard.*** The job of this wizard is to create your initial project file (`.jpr`).
- ***Resource Wizard.*** This is another clever little wizard which searches a Java class for string literals, copying them into a resource 'bundle' (usually a `.res` file). The source code is modified so as to retrieve the wanted string from the bundle.

Populous palettes

JBuilder comes with a very well stocked Component Palette which includes a large assortment of Borland components and standard AWT classes (see Figure 9). As previously mentioned, a number of Sun applets have been 'wrapped' as Java Beans in order to demonstrate the technology. Additionally, an entire page of the Component Palette is devoted to an assortment of controls created by the KL Group, creators of other award-winning graph/chart packages. Star of this particular assortment is a charting component called JClass Chart, but there are quite a number of other general purpose 'JClass' components including a four-way arrow button, multi-column list, outliner, progress meter, slider control, spin box, tab manager and table component. Numerous other JClass utility packages look to be very useful.

It's hard to make any definitive comments about the performance of the IDE because the beta software reviewed hadn't been optimised. Borland recommended 48 MB of RAM for running the beta whereas I was only using 32 MB. It would therefore be unfair to make any adverse comments about build speed. I found the IDE and compiler very snappy in performance terms, and it's reassuring to know that this can only improve in the final release.

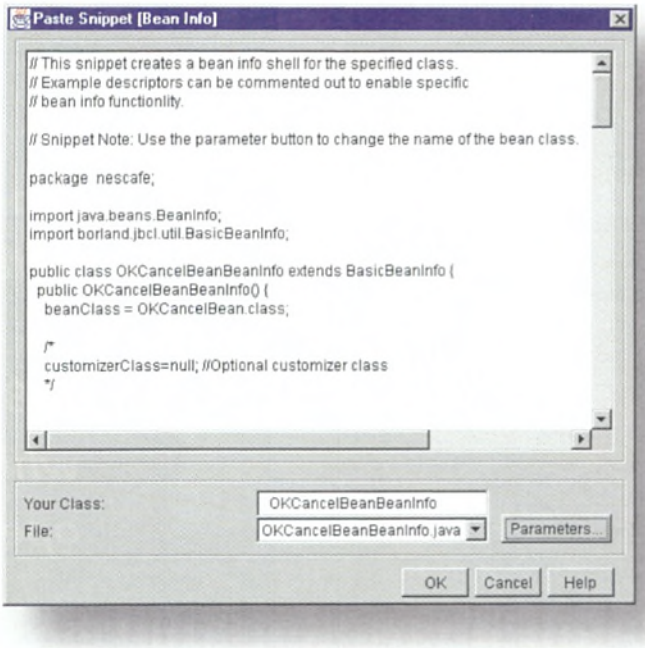

Figure 7 – This is the BeanInfo snippet strutting its stuff. Specify the wanted class name (this is always the name of the existing Bean class suffixed with 'BeanInfo', tell it what file to save the BeanInfo class into, and – hey presto – you've got some BeanInfo to associate with your Bean.

I began the review by mentioning that quite a bit of the JBuilder IDE is written using Java, and this might give you some cause for concern, especially if you've used the (relatively crude) Java tools supplied with Borland C++ 5.0. Rest assured there are no such performance problems here.

I'd say that the compiler falls midway between Delphi and most C++ development systems in terms of speed. In other words, not quite as instantaneous as Delphi, but very considerably faster than most C++ environments. The Borland Java compiler fully supports the latest language changes including inner classes and JAR files as previously mentioned. If you don't want to use the IDE (but you should!) there are command line versions of the compiler and make utilities available.

Borland refers to its new compiler as a SmartChecker. What this means is that it performs on-the-fly dependency checking, analysing any changes you make to the program code in order to determine which

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interdependent source files need to be rebuilt. This is a much superior system to simply relying on the time stamp of individual files. Dependent source files only get rebuilt if they depend upon some element which changed inside another file. In order to support this mechanism, JBuilder maintains dependency files for each package. These files are automatically created and maintained by the IDE, but JBuilder comes with pre-generated dependency files for use with the JDK and JBCL libraries.

Going native

Java devotees are divided into two deeply religious – and for the most part – mutually exclusive factions. On the one hand, there are those who I call the portability purists – people who believe that any Java compiler capable of creating native machine code is anathema and who can't see the logic in writing a Java application that's tied to a specific platform. On the other hand, are the realists who believe that Java is a great language in its own right and that if people want to use it to write Windows applications then why not?

Although I have some sympathy with the purists, I'm essentially a realist. Right from the word go, Microsoft included COM support in Visual J++ and has announced J/Direct, a technique for allowing fast access to the Windows API from a Java application. Bearing in mind the incredible momentum of the Microsoft juggernaut, it should be obvious to even the most devout Java puritan that they're out on a limb and Bill Gates is approaching with a chain saw.

I understand that Borland has a Java native code compiler, and actually used it to create the compiler that's built into this version of JBuilder. The native code compiler will be released into a future version of JBuilder so as to allow you the option of creating native Java applications if you want to – another nail in the purist coffin. Similarly, I'd be surprised if Borland didn't support J/Direct in a future release.

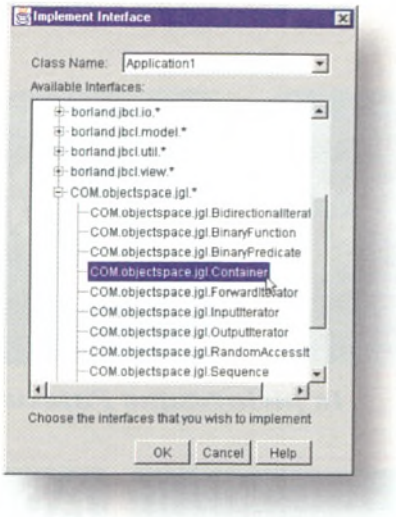

Figure 8 – The Interface Implementation Wizard is one of the many useful sages built into JBuilder. Using it, you can specify that the current class should implement a designated interface. The wizard will automatically add stub methods for all the necessary interface methods, and all you have to do is write the actual implementation.

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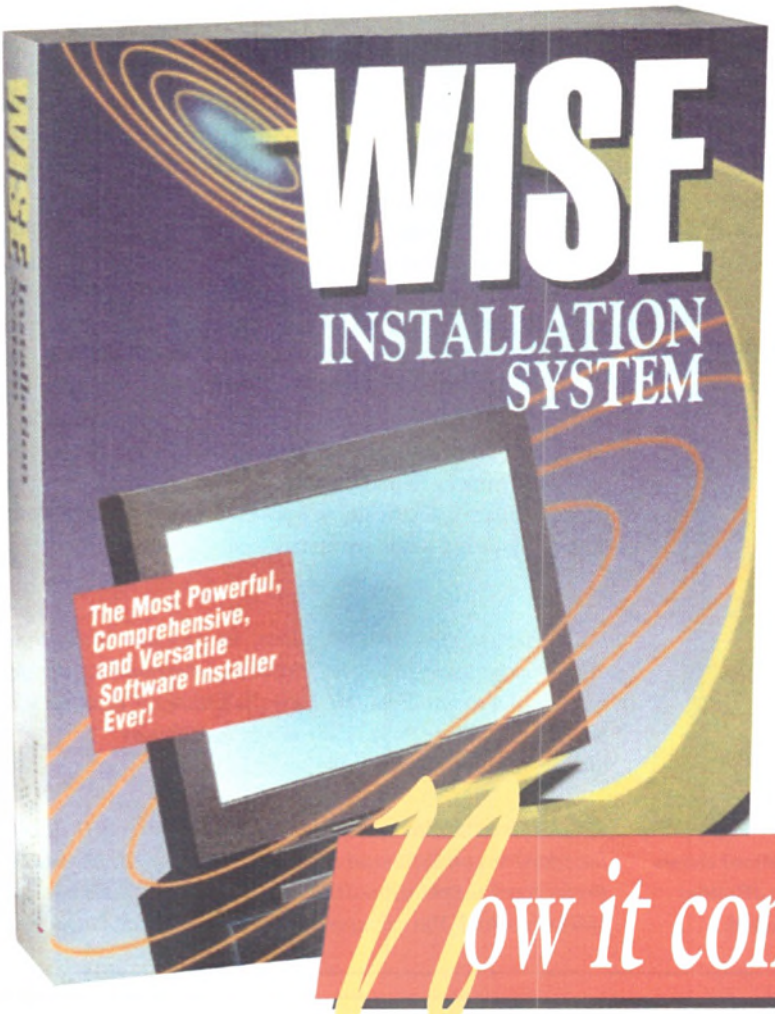

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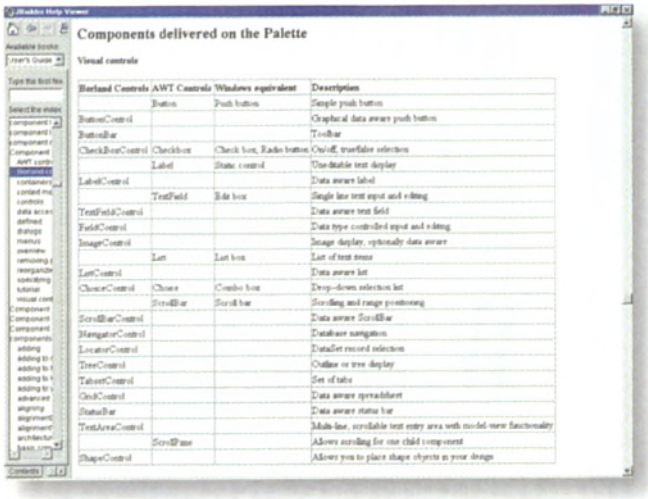
Missing pieces

There's a lot more that could be said about JBuilder, but it's hardly possible to do the product justice in a first-look beta review. Critics may complain, for example, that I haven't touched on the JDBC support and data components, and haven't mentioned other database features such as the new DataExpress scalable architecture which Borland plans to ship with JBuilder. At the time of writing, details of the DataExpress technology haven't been released but I'm told that by the time this is in print, you should be able to get the low-down from Borland's JBuilder site at *http://www.borland.com/jbuilder*.

Certainly, JBuilder represents the closest thing to Delphi for Java that I've seen. It also raises the stakes in terms of a productive user interface for application development and I fully expect the App-Browser approach to find its way into Delphi 4.0 and the next major release of C++ Builder.

I truly believe that JBuilder delivers a knockout blow to existing development systems. From now on, it will be my preferred Java development system, but Borland can't afford to sit on its laurels; allegedly, Anders Hejlsberg was hired by Microsoft (for a cool three million dollars) specifically to work on a new visual Java development system. Exciting times are ahead. ■



Components delivered on the Palette

Visual controls

Borland Controls	AWT Controls	Windows equivalent	Description
	Button	Push button	Simple push button
ButtonControl			Graphical data aware push button
ButtonBar			Toolbar
CheckBoxControl	Checkbox	Check box, Radio button	On/off, true/false selection
	Label	Static control	Uneditable text display
LabelControl			Data aware label
	TextField	Edit box	Single line text input and editing
TextFieldControl			Data aware text field
FieldControl			Data type controlled input and editing
ImageControl			Image display, optionally data aware
	List	List box	List of text items
ListControl			Data aware list
ChoiceControl	Choice	Combo box	Drop-down selection list
	ScrollBar	Scroll bar	Scrolling and range positioning
ScrollBarControl			Data aware ScrollBar
NavigatorControl			Database navigation
LocatorControl			DataSet record selection
TreeControl			Outline or tree display
TabsetControl			Set of tabs
GridControl			Data aware spreadsheet
StatusBar			Data aware status bar
TextAreaControl			Multi-line, scrollable text entry area with model-view functionality
	ScrollPane		Allows scrolling for one child component
ShapeControl			Allows you to place shape objects in your design

Figure 9 – 'This table (taken from the Borland documentation) shows some of the many components which are included on the JBuilder palette. See the text for a fuller discussion of what's included.

Dave Jewell is a freelance consultant, programmer and technical author specialising in low-level systems programming, development systems and compiler design. He is the author of 'Instant Delphi' published by Wrox Press. You can contact Dave as djewell@cix.compulink.co.uk.

JBuilder is scheduled to ship in the third quarter of 1997. JBuilder Standard has an Estimated Street Price (ESP) of £84-27, the JBuilder Professional is £399, while JBuilder Client/Server Suite has not yet been officially priced. You can upgrade from other Borland tools for £249.

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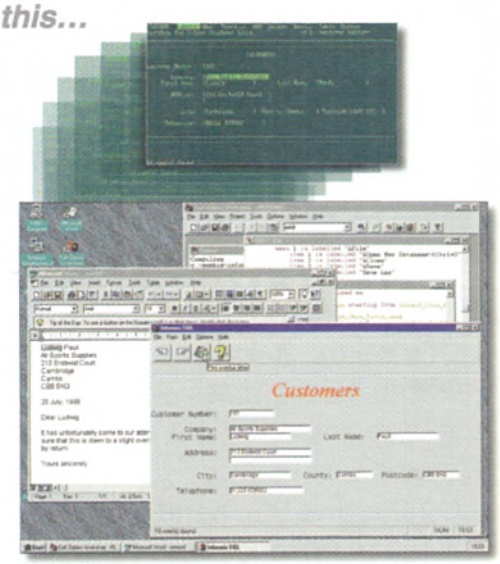

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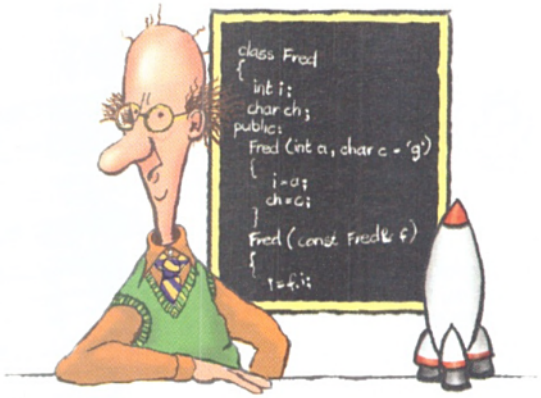

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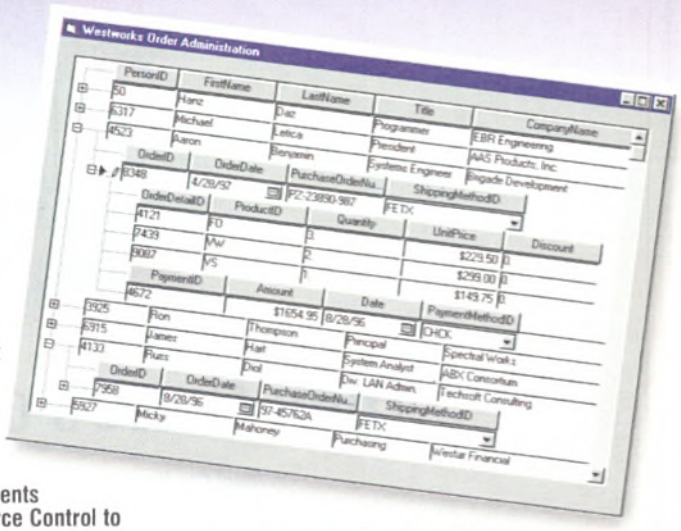

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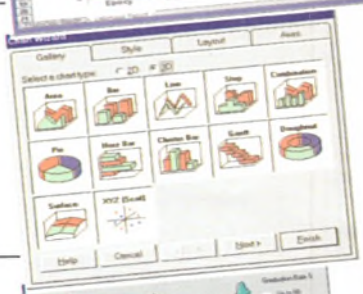

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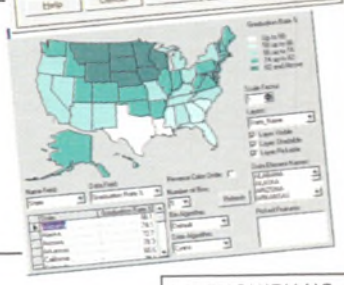

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Essential systems analysis, and its place in development

Most software projects end up not doing quite what they were intended to, one of the reasons is a failure to focus on the core issues. David Norfolk argues the case for essential systems analysis.

Coming up to Christmas I was talking over life with an old friend, as you do, and he told me about this horror project he was consulting on. A big organisation, with an in-house system in dBase 4, and the mother of all date problems. Year 2000? If only it was that sensible. This system coded the year in one digit and contained date comparison code along the lines of 'if year 5 is earlier than year 6 then...' – and it's already up to year 9.

Well, they've done it wrong and there are other problems with this system, all symptomatic of an original programmer who liked fixing database inconsistencies over the modem at 3am (which is more fun than playing DOOM, but isn't what he/she was paid for). Now they want a quick cheap fix – but there aren't any quick cheap fixes. Unfortunately, 'doing it wrong' means that all the fixes are slow and expensive. If you think about it, if you could throw together a badly designed mish-mash of a solution and fix it cheaply afterwards 1) you could sell a hell of a popular development method by formalising this approach a bit; and 2) good, careful analyst programmers would be out of a job. Sometimes, you just have to redevelop a bad system from scratch. It won't be cheap, it won't be painless and people may lose their jobs – probably the wrong people, since those responsible for the mess will have moved on – but that is what 'doing it wrong' means.

Patricia Deardorff

The essence of analysis

Still, there is hope, if you handle the rewrite really well. For instance, how much analysis do you think you'll have to do to avoid such a mess happening again? Wrong question. The right question is 'how little analysis do you have to do?' because the brownie points come from the working system, not a massive analysis effort. The secret is 'essential systems analysis' – the essence of the analysis, the 20% of the effort that delivers 80% of the results – and perhaps 100% of the results that really matter. The essential model is the system you'd build with perfect technology. It documents the necessary 'essential requirements' for the business function and nothing else. A good test of an 'essential requirement' is to ask whether it would be needed in any conceivable version of the system you're building. 'Subtract Sold Widget from Widget Stock' is an essential requirement because it is going to be part of any widget sales system, even a totally manual one, for example; but 'Authenticate Digital Signature on Widget Purchase Order' isn't, partly because it is technology dependent (it doesn't apply to paper orders) and partly because it isn't common to all conceivable widget sales systems (it wouldn't be necessary if purchases came in over a perfectly secure, autho-

rised, electronic channel; or if the purchaser arrived in person and paid cash). Note that although digital signature authorisation isn't an 'essential requirement' it may still be a very important part of one particular implementation of a widget sales system. It should be added at the design or coding stage, to a system with its structure already defined by essential analysis.

I won't give precise details of 'essential analysis modelling' because of the limited space, but it is as much a state of mind than a specific technique. (A reference to a textbook on formal essential modelling is given towards the end). As far as I am concerned, the essential model could be an A4 sheet listing user requirements and scope, a set of data-flow diagrams (as long as they don't cover all 4 walls of the room) or, more fashionably perhaps, even Ivar Jacobsen's 'Use Cases'

The essential model has good characteristics as a basis for development, because it is small and therefore easy to validate. The really complex stuff in most systems is input and output validation and interface design. You don't need that with perfect technology, so your essential model should fit on a couple of A4 sheets of paper and be quick to build. Conversely, if you can't agree with all the users on an essential model then either you don't understand the system or, more likely, there are several, partly inconsistent, views in the organisation about how the business process should work (it's good to find out about such things as early as possible).

The essential model is valuable because it encapsulates the 'critical success factors' for a project: if you just deliver the essential model the business will work (possibly, inefficiently, but at least you'll be in the right ballpark). It makes for maintainable systems, because changes or advances in technology only affect the imperfect technology outside the essential model and because you can easily divide change requests into those which will require serious effort and re-analysis (where the business process represented by the essential model has changed) and those which are 'trivial' (where just the technology or human computer interface has changed). Most important, however, since the essential model concentrates on business requirements and ignores the imperfections of technology, you have a sporting chance of getting the users to validate it for you.

Fighting alligators

Of course, most of the code in the system may well be implementing the stuff outside the essential model, but you can design this by yourself, with the help of the manual (as you probably do anyway). In the old days, there was always thought to be a gap between analysis modelling and systems design. Professional CASE (Computer Aided Systems Engineering) tools and formal methodologies put a lot of effort into bridging this gap. However, whatever we may think of it in theory, in practice this gap has become irrelevant in modern small-systems construction. Integrated, visual, development environments generate code in an iterative process and formal requirements analysis is often neglected – if the current prototype doesn't do the job, the next prototype will be changed until it does.

The essential model adds value to this process, even if it can't be converted into a final system automatically:

- It is, or should be, small and built quickly, so it won't be much of an overhead;
- It provides a reference point, which you can use to keep the evolving prototypes on track (when fighting alligators even business users can lose sight of the original plan to drain the swamp).

As long as the essential model's functionality is delivered (ie as long as you are building the right system), the rapid coding techniques are quite safe. Any design mistakes will be limited in scope – normally to particular interface and validation routines, where the technology-specific code is located. If the basic design morphology, defined by the essential model, is unaffected by a usability change or bug-fix then the correction is going to be both speedy and economic in resources and therefore fairly cheap/quick to fix. On the other hand, if you're building the wrong system fast, not only is fixing it expensive but you may actually start trying to use it for real, which can be even more expensive. The essential model even helps in object partitioning. Objects that encapsulate essential functions will be re-usable across a wide range of business systems using a range of technologies. The objects in a particular system can inherit from this 'essential' object and add methods to implement technology-specific function.

Whatever we say about design, however, people actually like coding; using tools like Microsoft's Visual Basic. Nevertheless, such tools do have problems. Uncontrolled development can lead to 'creeping featuritis' (prototyping which never ends as everyone involved thinks 'wouldn't it be nice if some extra little feature was added') and successful prototypes get used outside the business scope they were developed for. Visual Basic Professional Edition adds a diagramming tool (Visual Modeller) to the kit, which offers some help with design, but such tools don't document the business requirements, merely one possible design solution. The essential model is what links the requirements of the whole business community to the prototypes being developed by just a few representative business users.

What versus Why

Mind you, coding the right system isn't where the job ends: most systems spend most of their time in maintenance. The trick to effective maintenance is to divide requests into the quick and easy (design and coding changes) and those which involve a fundamental rethink of the system (changes to the essential business model). You can then deploy your resources more effectively. An under-resourced fundamental change is a recipe for introducing bugs and maintenance issues (which show up in future projects as an exponential decline in quality with maintenance), while an over-resourced code change project wastes resources and induces boredom. Programs will be maintained, often not by the programmers who wrote them. Sometimes today, code is so cheap that that it can be thrown away and rewritten from scratch. But without some kind of model of the

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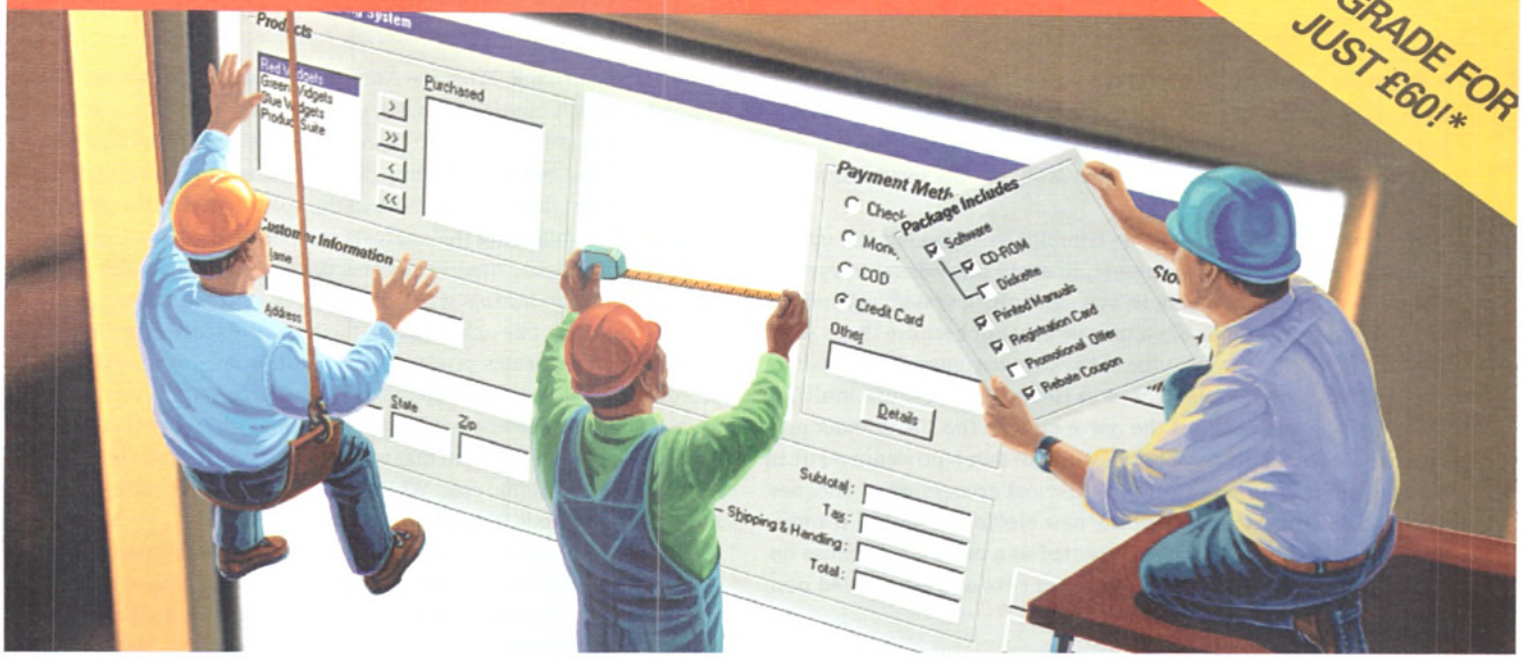

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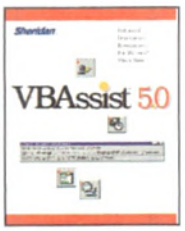

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original business requirements obsolescent functions can carry on from system to system 'just in case' and time can be wasted revisiting tricky bits of business logic over and over again. The code documents *what* the old system did very well; but the essential model documents *why*.

The reason for going to some troubles to document the *why* of computer systems is quite simple: to avoid unpleasant surprises and wasted effort. For example, you can build a system around the fact that every customer has a unique account because that's what your user tells you, or what the old system assumes. Only this system will fail when implemented in Hong Kong because multiple accounts per customer are the norm outside the UK. A bank may have had a whole department devoted to some procedure put in place to address an issue with the clerical processing of cheques. That is totally unnecessary in the new electronic money transfer system – but it's still there, represented as a program, because no-one ever analysed the system requirements and eliminated non-essential processes.

The Atlantic Systems Guild

Essential Systems Analysis is not my invention. As presented here it is simplification of ideas developed during a series of real-life projects over the period 1978-1984 by Stephen M McMenamin and John F Palmer and published in *Essential Systems Analysis*, Yourdon Press, 1984 (ISBN 0-13-287905-0. McMenamin and Palmer were involved in a sort-of Craft Guild for systems developers called the Atlantic Systems Guild, which trained me in systems analysis and design when I was engaged in introducing structured methods to a large American bank. From the Atlantic Systems Guild I learnt that methods weren't binding laws, set in stone, but guidelines to something which is still more a craft than an engineering discipline. I certainly don't feel bad about cherry-picking ideas out of McMenamin and Palmer, but there is a lot more in the book than is covered here. I suspect that following the analysis method in the book properly would deliver higher quality systems than we often get today – but many people who try this will become stuck in 'analysis paralysis' while others won't be able to make the leap to object design from a model which separates processes from data stores. It may be that prototyping with one user homes in on the 'true requirements' for all users faster than any model and that modern interactive development environments mean that we can always correct our mistakes without any additional cost. While it would be nice if this was true, I don't believe life is like that.

While I am convinced that we no longer have to worry about many of the disciplines of structured coding because development tools are so much better, I see no reason to believe that analysis quality isn't a continuing issue. We build systems very fast these days – but do these systems always do just what we want, and everything we want? I think not, and if we made just a small investment in 'essential modelling' then I think that they might. ■

David Norfolk had a long and misspent career in database administration, quality assurance, security, and networking, mostly for big merchant banks, until the 'wodge and burn' style of the City finally got to him and he retired to rural Wiltshire as a journalist. He can be contacted at drhys@cix.co.uk.

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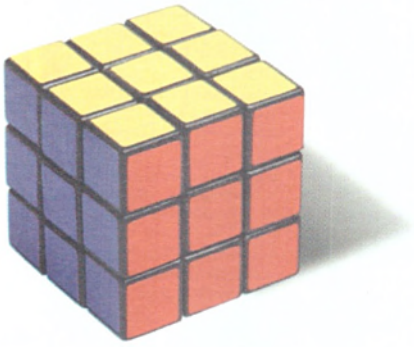

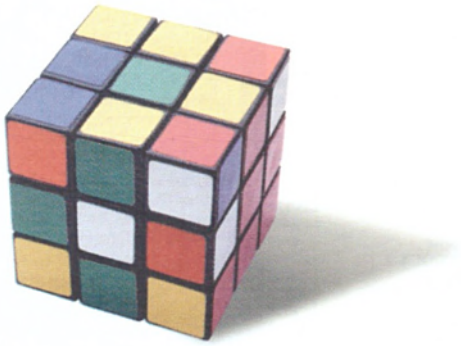

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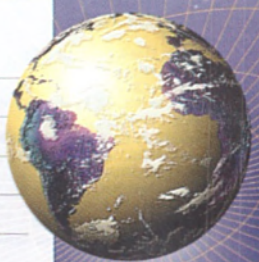

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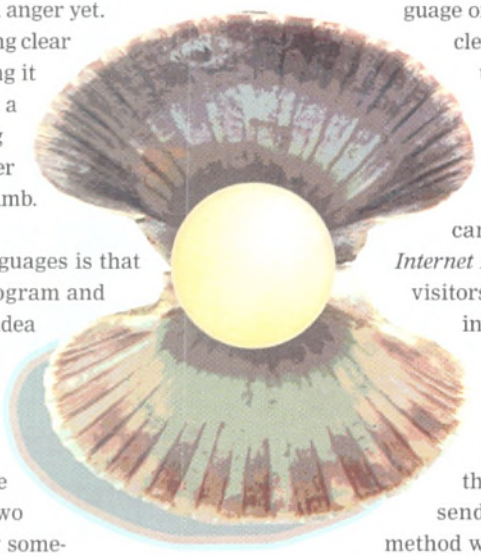
Enough Perl to get by

You should always use the language best suited to the job at hand, but do you really know all the languages available? Should you wait for a problem to arise to learn a new language? Peter Collinson felt it was the right time for him to learn Perl.

I find it quite hard to sit down and say: 'I'm going to learn that new language X' unless I have some reason for picking it up. I must confess to having read a few Java books in some attempt to understand what all the fuss is about, and I've even written some tiny demo Java programs, but I've not used the language in anger yet.

Perl's a different matter. I've been steering clear of Perl for some years. Again, I was avoiding it largely because I had not come up with a strong application that needed it, something that could not be done easily using some other tool. Perl always seemed a large hump to climb. The Web has given me the need to know.



The interesting aspect of scripting languages is that it's possible to pick up someone else's program and make tiny changes to it without any great idea of what the original script is doing. If you have a knowledge of the Unix Bourne shell, regular expressions and the C language, then you have a head start with Perl. There is, of course, a caveat. Once the script stops working, then you have two options. You can abandon the idea and try something else, or you can pull that Perl book down from your shelf and attempt to understand what is going on.

Now, the Perl book by Larry Wall, Tom Christiansen and Randal Schwartz isn't actually the easiest book in the world to get to grips with. I think of the book as more of a language specification than a document designed to teach you the language. However, it is somewhat of a must if you want to make any headway with Perl. The book is in its second edition covering Perl 5. There's an older book *Learning Perl* by Schwartz which takes a more step-by-step approach.

The first decision

You have to make some decisions before you try to get to grips with Perl. The first decision, and the biggie, is which Perl to choose? There are quite large differences between Perl 4 and Perl 5. Programs are not interchangeable and each system can bleat piteously about the language that you are feeding it. My take on this is easy, since I don't really know Perl, I'll follow the book using Perl 5 and hope that the Perl 5 version I am using has not diverged too much from the book contents.

Second, out there on the Net are a great number of Perl libraries that do this and that. Perl 5 has a kind of object programming feel to the way that these libraries are used. If you are aiming to write CGI scripts, should you make your life easier and pick up that useful library? Well, my personal view on this is no, at least at the start. I would rather write my own inept code and attempt to get that going rather than have to fight with someone else's API. There always comes a point where you will need to understand how the library works, and this will be okay when your knowledge of the language is greater than zero.

Third, do you spend time learning all the clever tricks that the language offers? Again, the answer is no. The problem with clever tricks is that they make your code difficult to understand, what you may understand today you will forget next time you look at the code, and then that little bit of clever coding will be the piece that you don't comprehend. KISS.

Well, the starting point for my CGI scripting career was the Perl scripts printed in *Managing Internet Information Services*. I wanted to create a simple visitors book application, where the user could type data into a web page and have it sent to me by email.

The HTML form I designed has some fields for user input which are named: `vis_name`, passing on the name of the user; `vis_email` for their email address; and `vis_comments`, a text area that they can type into. There are two methods of sending information from a Web Form: the `GET` method where arguments are passed in the URL and the `POST` method where the CGI script is served on its standard input channel with the data that the user typed. Most forms which transmit data use the `POST` method.

The first step in the process is to get the information from the user into a usable form in the Perl CGI script. Here's the start of the script:

```
#!/usr/bin/perl5
$webmaster = 'www@site.uk';
```

Here we are setting up a string variable with a constant value. Perl statements are terminated by a semicolon, and Perl will complain when you miss one. Note that scalar variables are preceded by the dollar sign, much the same as the standard Unix shell syntax. In some circumstances, the dollar sign is also used to force the interpretation of the contents of a list variable as a scalar value.

As you can see, string constants can be quoted in single quotes. If you use double-quotes, then the contents of the string will be evaluated, much like a shell, replacing any variable names (preceded by dollars) in the string by their contents. String constants can include a fairly standard set of back-slashed characters.

In general, variables are all global and don't need to be defined explicitly, you can just type in a new name and it will be created as needed, just like the Unix shell. The difference with Perl is that, if you wish, you can set a compiler instruction to force checking of names.

Next, we want to check that we've been called properly:

```
if ($ENV{'REQUEST_METHOD'} eq 'POST') {
```

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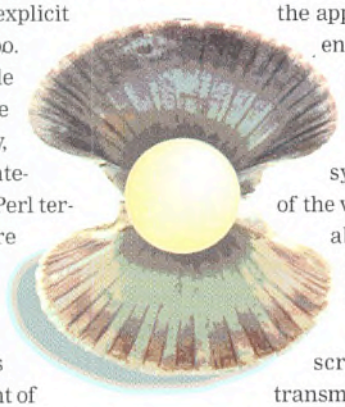
The CGI script is given several variables in the environment that tell the script how to decode the data that it is being sent. Here, all we do is to check that the script is being called using the `POST` method using an `if` statement.

Perl uses control statements that stick reasonably closely to the syntax of C. The `if` statement above precedes a block enclosed in curly braces. A difference between Perl and C is that there is an explicit *else-if* keyword `elsif`, and I continue to trip over the missing 'e'. Also, Perl doesn't have a `switch` statement.

The contents of the `if` testing statement requires some explanation. The `'POST'` value on the right-hand side is simply another constant string. The test is `eq` and not '`==`' because `eq` is an explicit string equality test. There's a corresponding `ne` test too.



The remaining left-hand side of the test looks a little like an array lookup, and this is exactly what it is. The curly braces are used to denote an associative array, where the index to the array is a string and not an integer value. Associative arrays are known as *hashes* in Perl terminology. The hash construction is used everywhere when programming in Perl for the web largely because we frequently want to translate some key that is a string into a value.

The `ENV` variable is an associative array which maps onto the *name=value* values taken from the environment of the program. Perl creates the associative array from these values when it starts to run your script. We are looking up the value of the environment variable `REQUEST_METHOD` and seeing whether it is equal to the constant `POST`. Incidentally, here's a case where we want to look at the scalar value of the hash entry, so we start the whole expression accessing the associative array with a dollar character.

Having determined that we are dealing with `POST` style of working, we now want to read the data that came from the browser.

```
read(STDIN, $buf, $ENV{'CONTENT_LENGTH'});
```

This `read` statement is fairly familiar. We are reading a certain number of bytes from the standard input channel and placing them into the scalar variable `$buf`. The web server provides the number of bytes that you can expect in the environment variable `CONTENT_LENGTH`. Actually, since we know that this read will not fail, we are not bothering to test for success or failure.

Passing the input

The data that we have been delivered is a set of *name=value* strings. Each string is separated by an ampersand character. Our first step is to split the string into a set of single statements. We'll do this using another primitive object, a list.

```
@pairs = split(/&/, $buf);
```

We are talking about a whole list and we use the `@` character to precede the variable name. The `split` function takes a regular expression that is its first argument and looks for occurrences of patterns that match the expression in the second argument. Here we are just looking for the ampersand character and will place several items from `$buf` into the `@pairs` list.

A list is an array and we can use conventional square bracket syntax to access it. We can write expressions involving things like `$pairs[2]`. Notice that since we would be using this value in a scalar context, we'll precede the variable name by a dollar character.

One way to process a list is to step through it sequentially using an index, and to aid that, Perl's also adopted the *csh* syntax where `$#pairs` will give you the last index in the list. However, we often want to steam through lists doing odd things, so there's a `foreach` statement, again lifted from *csh*, that permits you to step through all the values, one at a time. Here's the next bit of code:

```
foreach $p (@pairs) {
```

We've started a new loop setting the `$p` variable to the contents of each element in the `pairs` list. Remember that each of these items are *name=value* statements, and the intention is to place these values into an associative array called `@FORM` where the key is the name half of the assignment and its corresponding value is the remaining half. The first step is to split the pair into a name and value:

```
($name, $val) = split(/=/, $p);
```

We've seen the `split` command before, what's a little odd here is the appearance of two variable names on the left-hand side, enclosed in round brackets. This is a *list* assignment and is the standard way of decomposing list elements. We can make functions return lists of values and assign them to sets of scalar values using the list assignment syntax. The effect of this statement is to place the name of the variable from the `name=value` pair into the `$name` variable, while all the text on the right-hand side of the equals statement is placed into the `$val` variable. We can now deal with these entities separately.

The value side of the *name=value* pair from the CGI script is encoded, so any non-alphabetic character is transmitted as a numeric value expressed as a '`%`' character and two hexadecimal digits. Space characters happen frequently and are encoded as the character '`+`'. Let's convert any '`+`' to a space first:

```
$val =~ tr/+/ /;
```

Perl has several string operators that are kind of unary, the `tr` command is one of these. Essentially it doesn't take a value to operate on. In early Perl, you took the operand value from the magic current string and in fact you can still do that. However, in this example, we are using the *bind* operator `=~` that applies the string conversion in the `tr` statement to the contents of the left-hand side variable (here `$val`) and then resets the variable to the new value.

The `tr` statement behaves just like the standard Unix `tr` command, replacing all characters found in the first list by the matching character in the second.

Our next step is to decode the hexadecimal encoding and generate a character to insert into the `$val` string:

```
$val =~ s/%([a-f0-9][a-f0-9])/
            pack('C', hex($1))/gie;
```

This should be a single line but I've split it for printing. Again we are binding a string conversion action to a variable. The substitute operator is derived from the `s/old/new/` statement found in the Unix editors `ed`, `sed` and `vi`. The statement searches the input

```
#!/usr/bin/perl5
$webmaster = 'www@site.uk';

if ($ENV{'REQUEST_METHOD'} eq 'POST {

  read(STDIN, $buf, $ENV{'CONTENT_LENGTH'});
  @pairs = split(/&/, $buf);
  foreach $p (@pairs) {
    ($name, $val) = split(/=/, $p);
    $val =~ tr/+/ /;
    $val =~ s/%([a-f0-9][a-f0-9])/pack('C', hex($1))/gie;
    $FORM{$name} = $val;
  }
```

Listing 1 – A simple Perl script.

References & where to get Perl

The book *Programming Perl (2nd Edition)* by Larry Wall, Tom Christiansen and Randal L. Schwartz is published by O'Reilly & Associates and is ISBN 1-56592-149-6. Just in case you didn't know, Larry Wall is the originator of Perl.

Learning Perl is by R.L. Schwartz, again from O'Reilly & Associates. It's ISBN 1-56592-042-2.

The Perl script I am describing is lifted, stolen, and plagiarised from the excellent book *Managing Internet Information Sources* by Cricket Liu, Jerry Peek, Russ Jones, Bryan Buus and Adrian Nye. It's published by, you guessed it, O'Reilly & Associates and is ISBN 1-56592-051-1.

You can get Perl source from the Web: you are looking for the *Comprehensive Perl Network* or CPAN, the main URL for this is *http://www.perl.com*.

If you are a Microsoft user, then you are not left out. Perl is distributed by Microsoft for Windows NT 4.0, it's part of its resource kit.

Finally, if you want to see the code that I've been talking about in action then check out *http://www.hillside.co.uk/visitor.html*. You'll also find a link to the complete source of the CGI script on the *EXE* section of my Web site at *http://www.hillside.co.uk/articles/exe.html*.

string for some characters that match the regular expression found on the first half of the statement and replaces any text that is matched by the contents of the right hand side.

The statement is followed by some qualifying letters that affect what happens. The 'g' (global) means that the substitution is made repetitively, changing every occurrence of the regular expression in the string. Without the `'g'` only the first occurrence of the matched pattern is changed. The `'i'` forces a case-independent character match and the 'e' tells Perl that the right-hand side is an expression that will require evaluation before the substitution is made.

Let's look at the regular expression. This starts with the percent character '%'. This is followed by a round bracket. Let's skip that for a moment. The two square bracketed lists each match a single character from the set 0-9 and a-f. We are doing a case independent match, remember we've supplied the `'i'` option, so we don't need to specify A-F. The expression, therefore, will match a percent and a pair of hexadecimal characters.

The hexadecimal pair is placed in round brackets that allows us to pick up the matched value and use it in the right-hand side of the expression. If you look, this is done in the `hex($1)` part of the right-hand statement. The `$1` parameter is the contents of the first bracketed section from the matched string. The `hex` function takes a string value representing the hex number and converts it into a number. This is passed into the `pack` routine whose first parameter `'C'` tells it that its second argument is number coding an unsigned character, so it will return the character that is represented by the hexadecimal digits. This character replaces the three characters in the original string that were matched by the regular expression.

All that in one line of Perl. Well, we've decoded the value, and we have the name, so let's load our `FORM` associative array:

```
    $FORM{$name} = $val;
}     # end of foreach
```

This is all we want to do for the moment. What we've done is to decode the values that the user typed in the form. It's actually the hard part of the script, the piece with the most magic. Later in the script, the various boxes on the form can be accessed by using expressions like: `$FORM{'vis_name'}` will give the name users typed in, `$FORM{'vis_email'}` will give their email address and `$FORM{'vis_comments'}` will give the text that they typed into the comments section of the form.

My first 10 lines

We've looked at a lot of Perl in these ten lines (there should be eleven, I've missed the last closing brace). We've seen how to define and use variables; how to create a list and use its data; how to create an associative array and access its data. We've looked a little at `if` and `foreach` statements. We've seen some Perl built-in functions for string matching.

We can now carry on to send the mail to the person at the top of the form and also generate a nice looking HTML page that confirms what the user has done. I'll continue with that task and the general exploration of Perl 5 next month. ■

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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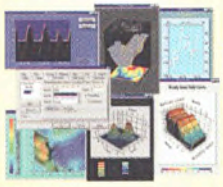

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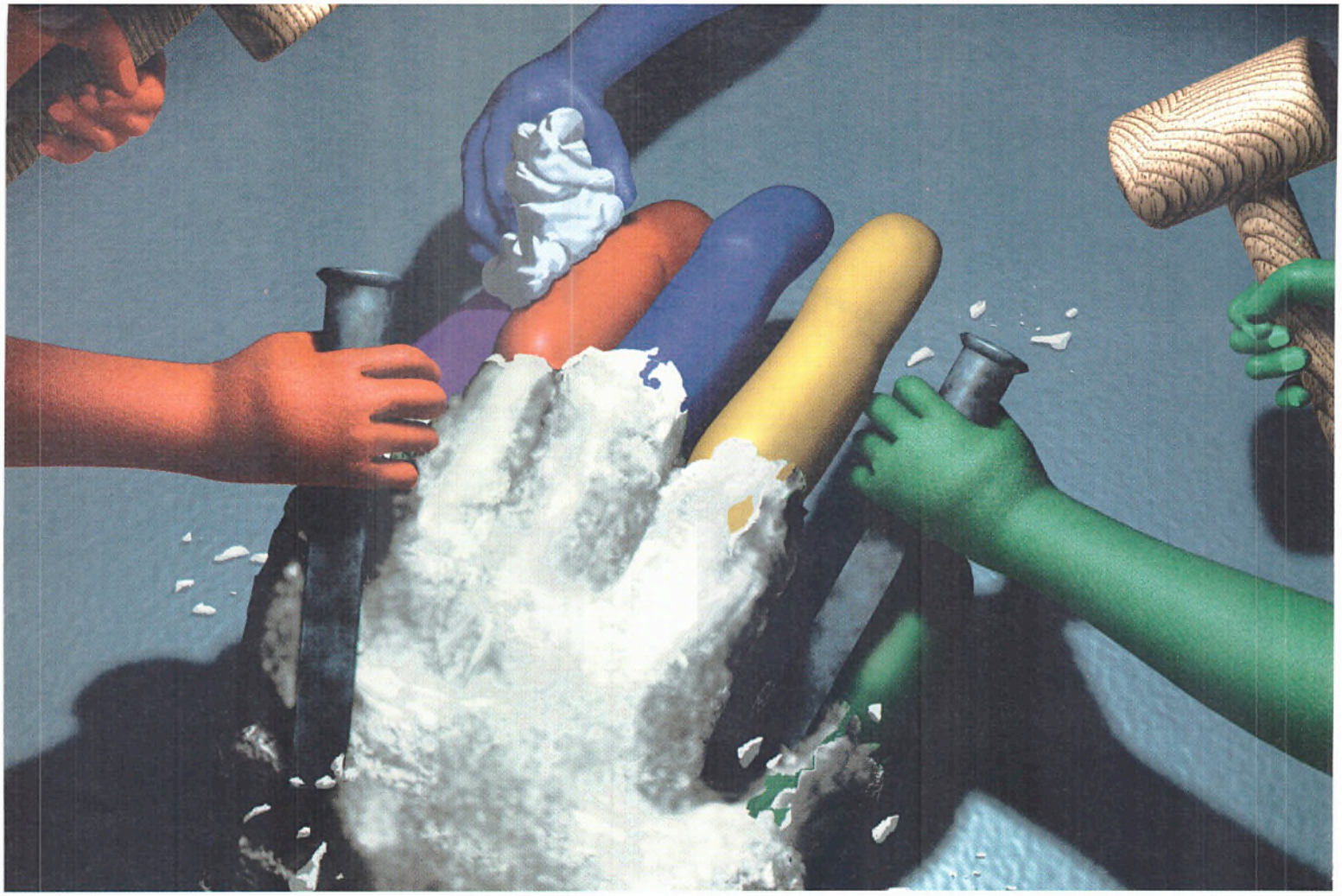

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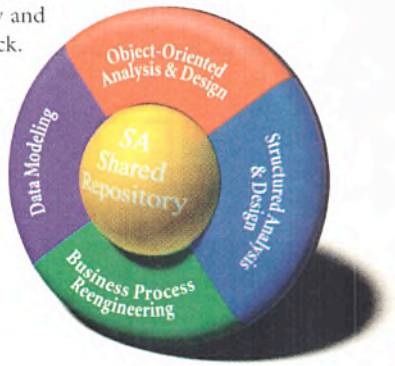

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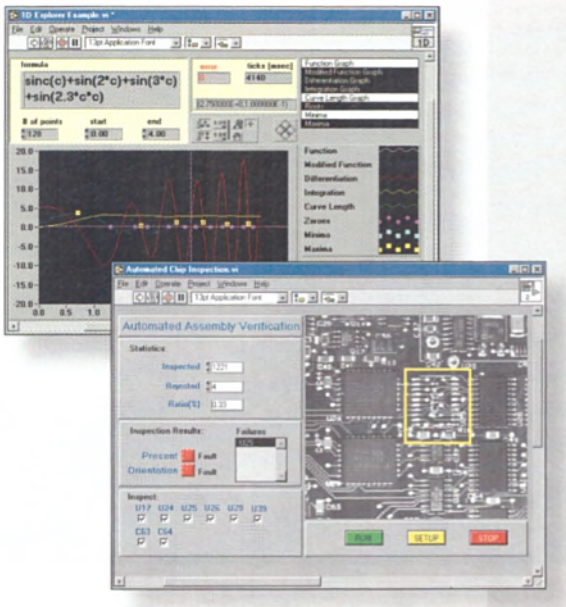

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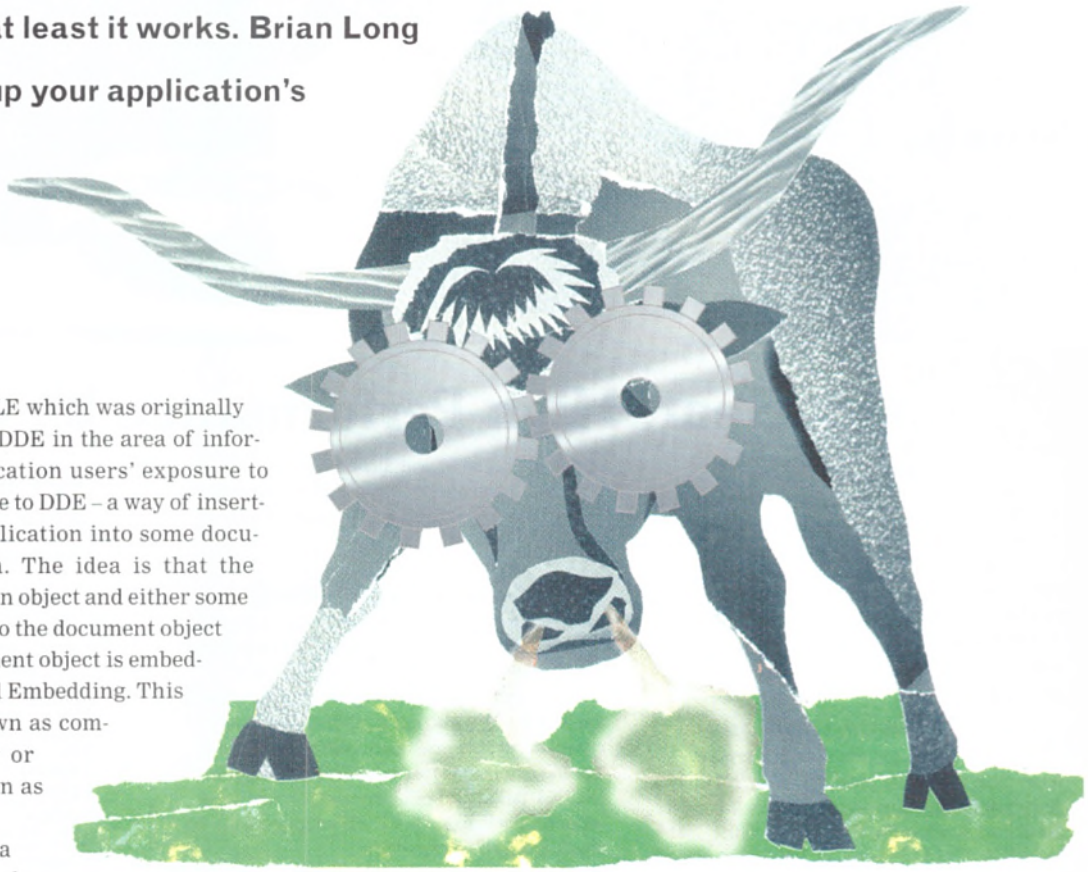
OLE automation with C++ Builder

It's not quite the component software revolution we were promised, but at least it works. Brian Long shows how to open up your application's services to OLE clients through automation.



Automation is one facet of OLE which was originally designed to take over from DDE in the area of information exchange. Most application users' exposure to OLE is similar to their exposure to DDE – a way of inserting information from one application into some document in another application. The idea is that the information is represented as an object and either some information describing a link to the document object is inserted, or the whole document object is embedded – hence Object Linking and Embedding. This aspect of OLE used to be known as compound document technology or OLE storage, but is now known as Active Documents.

Automation, however, is a separate aspect of OLE dedicated to allowing one application to control or automate another application. The application being controlled is called an automation server, and the one doing the controlling is called the automation controller or automation client. The client establishes the link between the two applications.

Like DDE, automation allows information to go backwards and forward between the applications, and also allows the client to cause functions to be executed in the server. Unlike DDE, where there is a distinction between conversation topics and items within each topic, automation is managed by objects. The server supports one or more objects that have properties and methods (aka member functions) available to external controllers. You can read and write properties, and call methods.

In order to invoke an automation server, it must be registered – that is it must have information stored in the Windows registry, sufficient to describe and locate it. This is another difference between DDE and OLE; a DDE client must rely on the DDE server being on the path, or must know where it resides. An automation client doesn't care, as Windows will find where the server application resides by examining the registry. To start controlling an automation server you ask the support DLLs to create an appropriate object. In the case of Microsoft Word, you would create a Word.Basic object. Once OLE has given you the object, you can control it.

Word.Basic is effectively a class that you are creating an instance of and it is sometimes referred to as the OLE class name or a class string, but is correctly termed (as far as OLE is concerned) a ProgID.

It is worth noting at this point that the automation server can be an application or a DLL. Because a 32-bit DLL lives in the process address space of the executable that uses it, servers written as DLLs are called in-process servers. Executable servers are out-of-process servers. ActiveX controls are OLE in-proc automation servers with specific extra bits in to make them work as visual controls.

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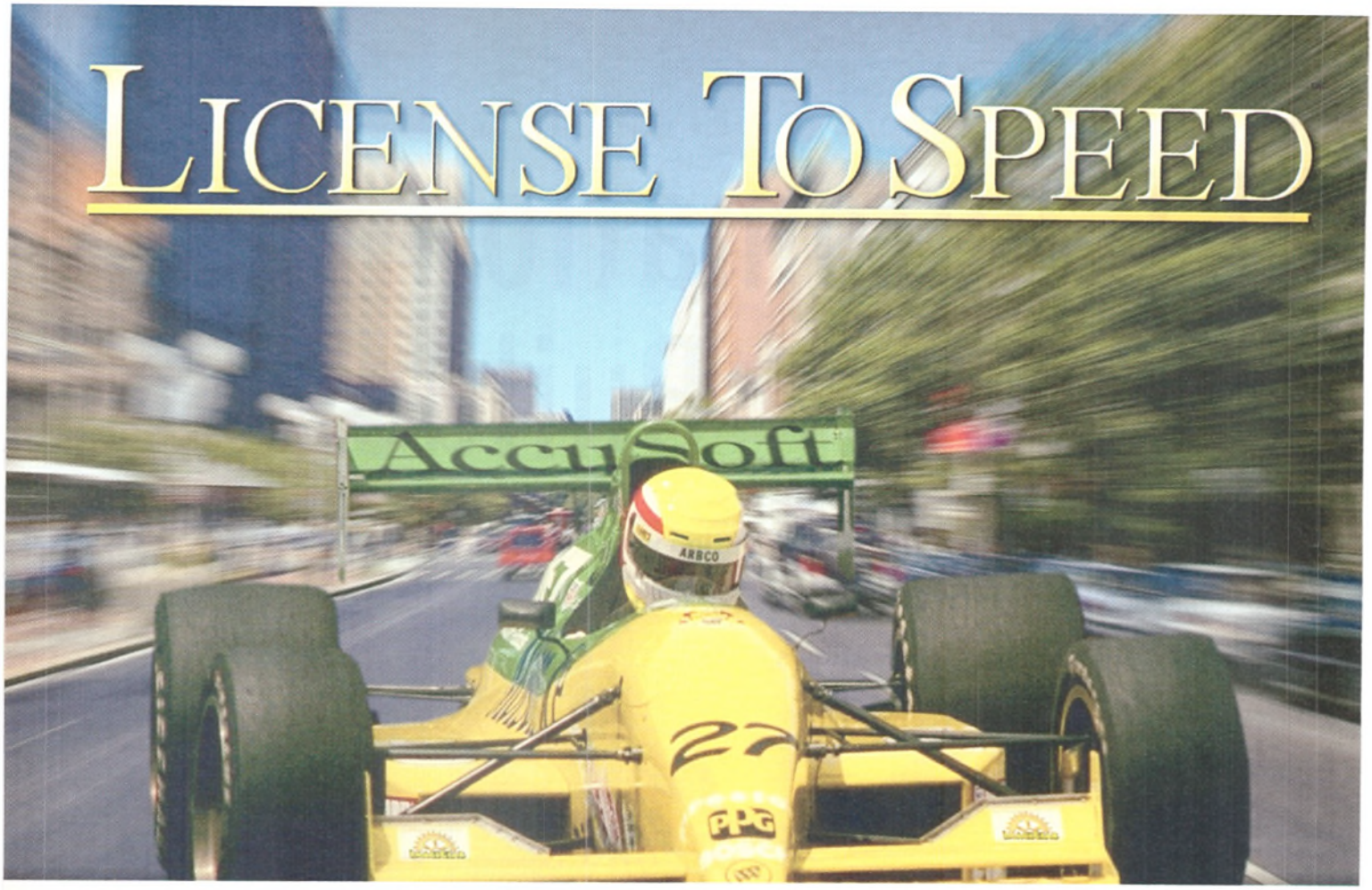

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```
//---------------------------------------------
#include <vcl\vcl.h>
#pragma hdrstop
//---------------------------------------------
USEFORM("OleWordMainFormUnit.cpp", Form1);
USERES("OleWord.res");
//---------------------------------------------
WINAPI WinMain(HINSTANCE, HINSTANCE, LPSTR, int)
{
   try
   {
      Application->Initialize();
      Application->CreateForm(__classid(TForm1), &Form1);
      Application->Run();
   }
   catch (Exception &exception)
   {
      Application->ShowException(&exception);
   }
   return 0;
}
//---------------------------------------------
//---------------------------------------------
#include <vcl\oleauto.hpp>
#include <vcl\vcl.h>
#pragma hdrstop

#include "OleWordMainFormUnit.h"
//---------------------------------------------
#pragma resource "*.dfm"
TForm1 *Form1;
//---------------------------------------------
__fastcall TForm1::TForm1(TComponent* Owner)
   : TForm(Owner)
{
}
//---------------------------------------------
void __fastcall TForm1::Button1Click(TObject *Sender)
{
   //This way requires OleAuto.Hpp to be included
   //MSWord = CreateOleObject("Word.Basic");

   //This way doesn't require any headers
   MSWord = MSWord.CreateObject("Word.Basic");

   //This is the standard way of calling a
   //routine in an OLE server
   //MSWord.OleProcedure("AppShow");
   //But here is another way:
   Procedure AppShow("AppShow");
   MSWord.Exec(AppShow);
}
//---------------------------------------------
void __fastcall TForm1::Button2Click(TObject *Sender)
{
   MSWord = Unassigned;
}
//---------------------------------------------
void __fastcall TForm1::Button3Click(TObject *Sender)
{
   Procedure FileNew("FileNew");
   MSWord.Exec(FileNew);
}
//---------------------------------------------
void __fastcall TForm1::Button4Click(TObject *Sender)
{
   Procedure Insert("Insert");
   MSWord.Exec(Insert << Memo1->Text);
}
//---------------------------------------------

//---------------------------------------------
void __fastcall TForm1::Button5Click(TObject *Sender)
{
   //Update Word's doc stats
   MSWord.OleProcedure("DocumentStatistics");
   //Obtain doc stats using 2 variants
   Variant CurValues = MSWord.OleFunction("CurValues");
   Variant DocStats = CurValues.OleFunction("FileSummaryInfo");
   ListBox1->Items->Clear();
   ListBox1->Items->Add(
      String(DocStats.OleFunction("NumPages")) + " pages");
   ListBox1->Items->Add(
      String(DocStats.OleFunction("NumParas"))
            + " paragraphs");
   ListBox1->Items->Add(
      String(DocStats.OleFunction("NumLines")) + " lines");
   ListBox1->Items->Add(
      String(DocStats.OleFunction("NumWords")) + " words");
   ListBox1->Items->Add(
      String(DocStats.OleFunction("NumChars"))
            + " characters");
}
//---------------------------------------------
```

Listing 1 – The OleWord example application.

Controlling automation servers

The C++ Builder support for controlling automation servers revolves around variables of type `Variant`, which is a class. A `Variant` variable can have values of different types assigned to it and read from it. Visual Basic and Delphi both support `Variants` as native types but C++ Builder implements a class to represent them. For example the following code is valid.

```
Variant V = 5;
V = "Hello";
V = True;
V = 5.75;
String S = V; // S now has "5.75" in it
```

In addition to integers, reals, strings, booleans, date-and-time values, and arrays of varying size and dimension with elements of any of these types (including `Variants`), a `Variant` is used to represent connections to automation objects. An automation server is an application that implements a derivative of OLE 2's `IDispatch` interface, and a `Variant` can contain a reference to an `IDispatch` object.

To set one up, you can `#include oleauto.hpp` and call `CreateOLEObject()`, assigning the result to a `Variant`. Alternatively you can call the `CreateObject()` method and assign that to a `Variant`, which tends to be simpler, as it doesn't involve another header file. The server object will then be available until the server application is closed by the user, you explicitly terminate it programmatically, or the `Variant` goes out of scope. This means that if you declare a `Variant` local to an event handler, or other routine, then when the routine ends the OLE object will be destroyed.

Here's an example using Microsoft Word as the server. The full code can be found in Listing 1. In the following code a `Variant MSWord` is declared as a private data field in the form class. Two buttons are placed on the form.

```
void __fastcall TForm1::Button1Click(TObject *Sender)
{
  MSWord = MSWord.CreateObject("Word.Basic");
}
void __fastcall TForm1::Button2Click(TObject *Sender)
{
  MSWord = Unassigned;
}
```

If you wish to use the previously mentioned alternative to the `Variant CreateObject` method, then include the OleAuto.hpp header right at the top of the unit. Placing this before the already present vcl\vcl.h seems to make the pre-compiled header system

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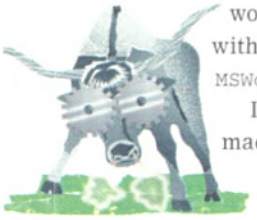


work better. Then an OLE automation session with Word can be invoked using:

```
MSWord = CreateOleObject("Word.Basic");
```

If Word is not running, but is set up on your machine, these statements cause Word to be invoked (but not necessarily seen) and terminated respectively. If Word is already running, this code causes a connection to be made, and dropped, to that Word instance. If Word is unavailable, `CreateObject()` will raise an `EOleSysError` exception.

By default, most automation servers will remain hidden when invoked by a controller. If your version of Word starts hidden and you want to see it, you will need to call one of the `Word.Basic` methods to do the job. In order to find out what methods, properties and objects exist you will need to rely on documentation from the server vendor. In the case of Word, the automation interface matches very closely the entirety of the Word Basic language. Since Word Basic has an `AppShow` command to make Word visible, the `Word.Basic` object has an `AppShow` method. To call the OLE object methods we use either the `OleFunction()` or `OleProcedure()` methods of the `Variant` depending on whether it returns a value or not. Follow the call to `CreateOleObject` with:

```
MSWord.OleProcedure("AppShow");
```

Note that in contrast to a C++ Builder member function call, in order to call a member function of an automation object we must pass its name and any parameters along to either the `OleProcedure` or `OleFunction` member functions of the `Variant`. The `OleFunction` method should be used if the OLE member function returns a value. If the specified member function is invalid you will get an exception at run-time rather than a compile-time error.

An alternative way of calling routines in an OLE server relies on using the `Exec` member function. `Exec` takes an `AutoCmd` object as a parameter. There are two useful `AutoCmd` descendent classes: `Function` and `Procedure`. They can be used like this:

```
Procedure AppShow("AppShow");
MSWord.Exec(AppShow);
```

Now add two more buttons and a memo to the form, and insert this code:

```
void __fastcall TForm1::Button3Click(TObject *Sender)
{
  MSWord.OleProcedure("FileNew");
}
void __fastcall TForm1::Button4Click(TObject *Sender)
{
  MSWord.OleProcedure("Insert", Memo1->Text);
}
```

You should find you can connect to Word, get a new file created, copy the memo's text to the Word document and then disconnect from Word.

Depending how advanced the server is, the various properties available may return back more OLE objects that have their own methods and properties. Place one more button on the form and a listbox. Use the following code for the button and notice the temporary variables used to mark the additional OLE objects that Word returns.

```
void __fastcall TForm1::Button5Click(TObject *Sender)
{
  //Update Word's doc stats
  MSWord.OleProcedure("DocumentStatistics");
  //Obtain doc stats using 2 variants
  Variant CurValues =
    MSWord.OleFunction("CurValues");
```

```
//---------------------------------------------
#include <vcl\vcl.h>
#pragma hdrstop
//---------------------------------------------
USEFORM("ServerMainFormUnit.cpp", Form1);
USERES("Server.res");
USEUNIT("ServerOLEClassUnit.cpp");
//---------------------------------------------
WINAPI WinMain(HINSTANCE, HINSTANCE, LPSTR, int)
{
   try
   {
      Application->Initialize();
      Application->CreateForm(__classid(TForm1), &Form1);
      Application->Run();
   }
   catch (Exception &exception)
   {
      Application->ShowException(&exception);
   }
   return 0;
}
//---------------------------------------------
//---------------------------------------------
#include <vcl\oleauto.hpp>
#include <vcl\vcl.h>
#pragma hdrstop

#include "ServerMainFormUnit.h"
//---------------------------------------------
#pragma resource "*.dfm"
TForm1 *Form1;
//---------------------------------------------
__fastcall TForm1::TForm1(TComponent* Owner)
   : TForm(Owner)
{
   if (Automation->StartMode == smAutomation)
   {
      //Don't show main form
      Application->ShowMainForm = False;
      //Also don't show task bar button for server
      ShowWindow(Application->Handle, SW_HIDE);
   }
}
//---------------------------------------------
//---------------------------------------------
#include <vcl\vcl.h>
#pragma hdrstop

#include "ServerOLEClassUnit.h"
//---------------------------------------------
__fastcall TMyOleServer::TMyOleServer()
   : TAutoObject()
{
}
//---------------------------------------------
TDateTime __fastcall TMyOleServer::GetTheTime(void)
{
   return Time();
}
//---------------------------------------------
void __fastcall TMyOleServer::DefaultMemberFunction(void)
{
   ShowMessage("This is the server's default routine");
}
//---------------------------------------------
void __fastcall RegisterTMyOleServer()
{
   TAutoClassInfo AutoClassInfo;

   AutoClassInfo.AutoClass = __classid(TMyOleServer);
   AutoClassInfo.ProgID = "Server.MyOleServer";
   AutoClassInfo.ClassID =
            "{EC65E080-930A-11D0-9FEA-A42B00C10000}";
   AutoClassInfo.Description =
            "This is my first Automation server";
   AutoClassInfo.Instancing = acMultiInstance;

   Automation->RegisterClass(AutoClassInfo);
}
//---------------------------------------------
#pragma startup RegisterTMyOleServer
//---------------------------------------------
```

Listing 2 – the automation server application.

```
  Variant DocStats =
    CurValues.OleFunction("FileSummaryInfo");
  ListBox1->Items->Clear();
  ListBox1->Items->Add(String
    (DocStats.OleFunction("NumPages")) + " pages");
  ListBox1->Items->Add(String
    (DocStats.OleFunction("NumParas"))
    + " paragraphs");
  ListBox1->Items->Add(String
    (DocStats.OleFunction("NumLines")) + " lines");
  ListBox1->Items->Add(String
    (DocStats.OleFunction("NumWords")) + " words");
  ListBox1->Items->Add(String
    (DocStats.OleFunction("NumChars")) + " characters");
}
```

Calling an automation server is easy enough as long as you know what methods and properties it exposes and what its ProgID is.

Writing an automation server

The process of writing an automation server is very straightforward and is accomplished through an automation Wizard. Properties and methods are marked as available to automation clients and the Wizard takes care of registering the server.

Let's start by making a new application. Select File | New... and choose Automation Object from the Object Repository. Supply a C++ Builder class name (`TMyOleServer`), an OLE class name or ProgID (one has already been made as `Server.MyOleServer`), a description (for example `"This is my first automation server"`) and an instancing option. This is needed to tell Windows what to do if a second application tries to create an object from your server. Multiple instancing means that a second object from your server must come from a separate application instance – not the same one. Single instancing means that multiple objects can come from one instance of the server. DLL servers are always marked multiple. We will leave our server marked multiple as well.

Pressing OK manufactures a unit with your class laid out, and various registration details. You should not modify anything here except (if needed) the description and instancing option. The ProgID is the OLE class name that automation controllers will use when creating one of your objects, and the class ID is a GUID (Globally Unique IDentifier) which is tied to your ProgID. Both these details will ultimately be stored in the registry.

Note that in the unit header the class has an `__automated` section – it is here that you place properties and methods that you want to be available to OLE controllers. Let's proceed and implement a simple OLE automation server class that surfaces a property called `TheTime`. As the name suggests, this does nothing more interesting than return the current time.

A couple of important points to remember are that member functions invoked by automation controllers either directly, or via properties, must not be implemented in the class declaration. In other words they must not be implemented as inline routines, otherwise you will see bad run-time failures. Also, member functions that are declared or referred to in the `__automated` section must be declared with the `__fastcall` calling convention modifier.

```
class TMyOleServer : public TAutoObject
{
private:
  TDateTime __fastcall GetTheTime(void);
```

```
//---------------------------------------------
#include <vcl\vcl.h>
#pragma hdrstop
//---------------------------------------------
USEFORM("ClientMainFormUnit.cpp", Form1);
USERES("Client.res");
//---------------------------------------------
WINAPI WinMain(HINSTANCE, HINSTANCE, LPSTR, int)
{
   try
   {
      Application->Initialize();
      Application->CreateForm(__classid(TForm1), &Form1);
      Application->Run();
   }
   catch (Exception &exception)
   {
      Application->ShowException(&exception);
   }
   return 0;
}
//---------------------------------------------
//---------------------------------------------
#include <vcl\oleauto.hpp>
#include <vcl\vcl.h>
#pragma hdrstop

#include "ClientMainFormUnit.h"
//---------------------------------------------
#pragma resource "*.dfm"
TForm1 *Form1;
//---------------------------------------------
__fastcall TForm1::TForm1(TComponent* Owner)
   : TForm(Owner)
{
   //Create the server
   Server = CreateOleObject("Server.MyOleServer");
   //Make the timer tick immediately
   Timer1->OnTimer(Timer1);
}
//---------------------------------------------
void __fastcall TForm1::Timer1Timer(TObject *Sender)
{
   try
   {
      //Put time on form caption
      Caption = Server.OleFunction("TheTime");
   }
   catch (EOleError& E)
   {
      //if there was an OLE problem
      Caption = E.Message;
   }
   //Make the application icon match the form caption
   Application->Title = Caption;
}
//---------------------------------------------
```

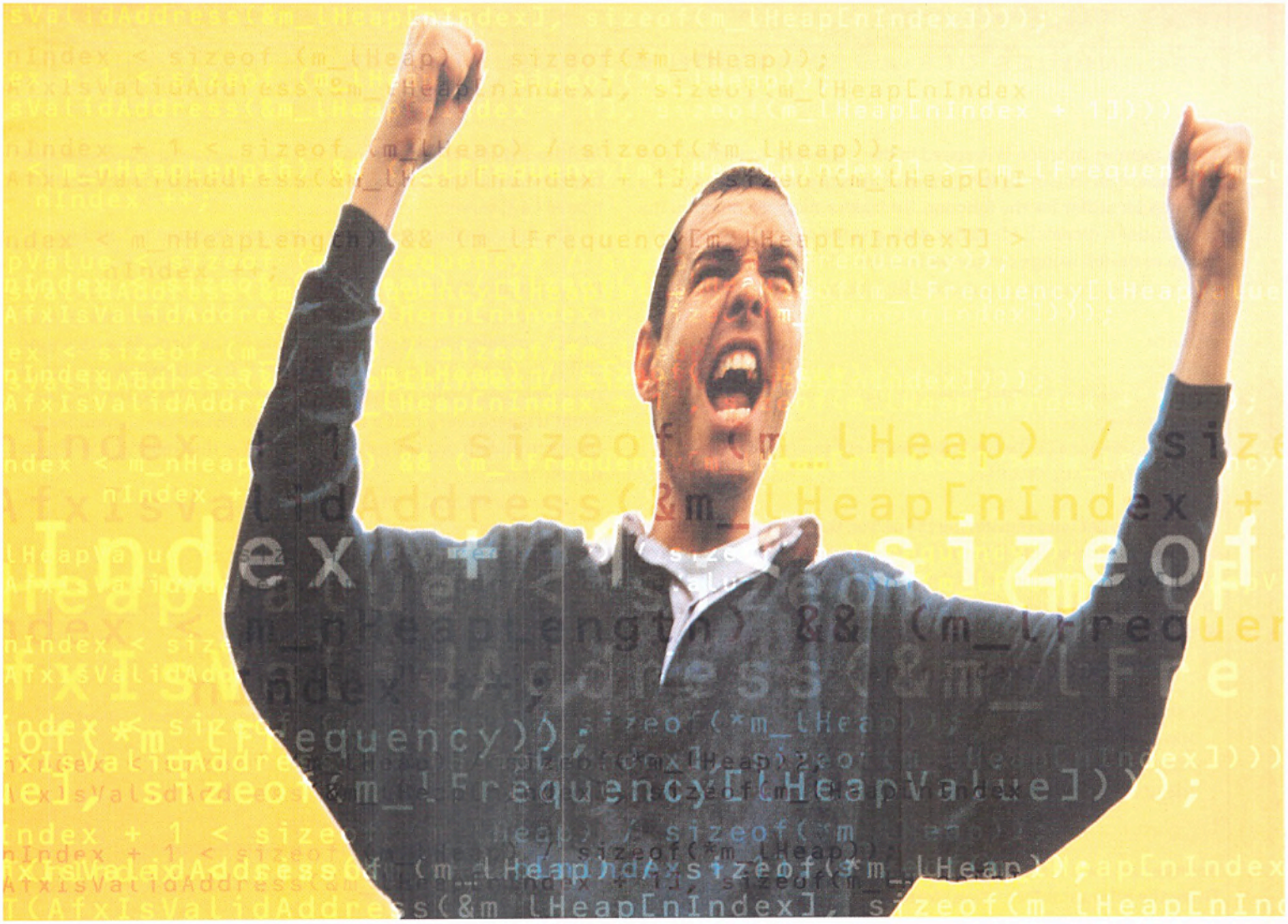
Listing 3 – the automation client application.

```
public:
        __fastcall TMyOleServer();
__automated:
  __property TDateTime TheTime = { read=GetTheTime };
};
```

Having modified the class declaration in the unit header as shown above, the implementation of the `GetTheTime()` member function must be placed in the unit itself:

```
TDateTime __fastcall TMyOleServer::GetTheTime(void)
{
  return Time();
}
```

Some development systems that support writing OLE automation controllers allow you to call upon a server's default property or member function by not specifying any specific property or function. While it seems that C++ Builder does not cater for calling upon a server's default bits and pieces (unlike Delphi and Visual Basic) it does allow you to specify a default member function in a server.



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If a member function is declared in the `__automated` section of an OLE class, then employing the `__dispid` directive lets you hard code a dispatch identifier for the function. To make a member function the default, use a dispatch identifier with a value of `DISPID_VALUE` as shown in the following example declaration:

```
class TMyOleServer : public TAutoObject
{
private:
public:
        __fastcall TMyOleServer();
__automated:
  void __fastcall DefaultMemberFunction(void)
__dispid(DISPID_VALUE);
};
```

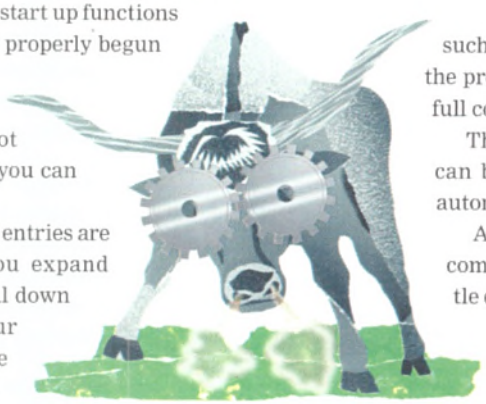
Before we get onto registering the server, there's that little matter of hiding the main form if we are started under automation control. Make an `OnCreate` handler for the main form and put this statement in (you will again need to use the vcl\OLEAuto.hpp header at the top of the main form unit):

```
if (automation->StartMode == smautomation)
{
  //Don't show main form
  Application->ShowMainForm = False;
  //Also don't show task bar button for server
  ShowWindow(Application->Handle, SW_HIDE);
}
```

Registering the automation server

To get the relevant information stored in the registry we need to run our application. This will cause the server to write all the appropriate information into the registry. An alternative method is to run the application with the command line switch `/regserver`. If at some later point you need to unregister the server, use the parameter `/unregserver`.

The mechanism used to deal with command-line parameters is the `Application->Initialize()` statement in the project source file. This allows the `OLEAuto` unit to hook in and execute some code after all the initialisation sections and start up functions have executed, but before the program has properly begun to handle any events. As far as VCL is concerned, that is the only purpose for the call to `Initialize()` so if you are not writing an automation server application you can safely remove it.



When a server is registered, a number of entries are added into the Windows registry. If you expand `HKEY_CLASSES_ROOT` in `regedit` and scroll down until you see `Server.MyOleServer` (our server's ProgID), click on it and you will see that its value matches your server description: `"My first automation server"`. If you expand the key, you can see a CLSID key. The class ID should match what you saw in the registration information in the C++ Builder class unit. When OLE is told to make a `Server.MyOleServer` object it will be able to find the class ID. It then does some cross-referencing. Scroll back up through `HKEY_CLASSES_ROOT` until you find the CLSID key and expand it. You will find many GUIDs listed. Scroll down until you see your GUID and select it. The value is again your server's class description. If you expand the key, you can see a ProgID key whose value will be `Server.MyOleServer`. Additionally there is a key marked `LocalServer32` which contains the command-line necessary to launch this 32-bit local machine hosted OLE server.

The full code for the server example can be found in Listing 2.

Putting it all into place

To test out the new server object, make a new project and declare a `Variant` object in the `private` section of the form class (this time call it `Server`). Add a timer component from the System page of the component palette and set its interval to 500 (so the `OnTimer` event triggers every half a second). Make an `OnCreate` handler for the form and an `OnTimer` event handler for the timer and set them up like this:

```
__fastcall TForm1::TForm1(TComponent* Owner)
        : TForm(Owner)
{
  //Create the server
  Server = Server.CreateObject("Server.MyOleServer");
  //Make the timer tick immediately
  Timer1->OnTimer(Timer1);
}
void __fastcall TForm1::Timer1Timer(TObject *Sender)
{
  try
  {
    //Put time on form caption
    Caption = Server.OleFunction("TheTime");
  }
  catch (EOleError& E)
  {
    //if there was an OLE problem
    Caption = E.Message;
  }
  //Make the application icon match the form caption
  Application->Title = Caption;
}
```

The exception handling block helps cater for such problems as the server not being registered, or the property not being available. See Listing 3 for the full code.

That's all there is to it. The completed server DLL can be called from any language which supports automation, including Delphi and Visual Basic.

Although this is a relatively simple example, very complex automation servers can be written with little extra effort. Indeed many of today's major applications have been coded to act as automation servers, including Microsoft Office. In addition the Windows 95 shell and third-party shell extensions are written as specific types of in-process automation server. The ability of RAD development tools such as C++ Builder to take advantage of this mechanism makes it easy to open your applications up to re-use and infinite extensibility. Happy coding! ■

Brian Long is a UK-based freelance Delphi and C++ Builder consultant and trainer. He is available for bookings and can be contacted at brian@blong.com. Professional enquiries should go to consultancy@blong.com or training@blong.com.

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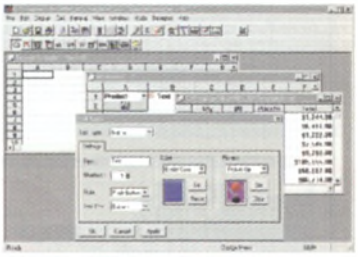
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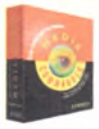

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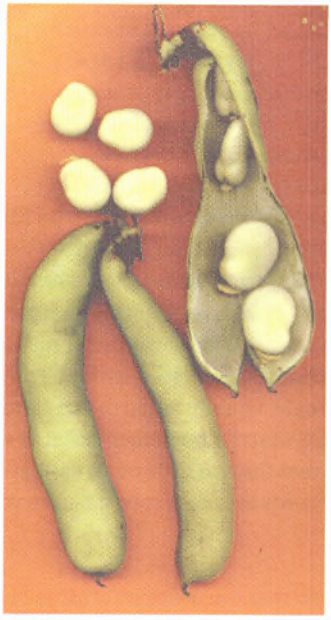
Beans, Beans, the magical fruit...

In his previous column, Tom Guinther made reference to JavaBeans. This month, he tackles them in detail and looks at the basic issues involved in the design and implementation of a timer bean.



You may recall my short description of JavaBeans: it is an API designed to define a Java software component model where 'beans' are 'lightweight', reusable components which can be used to build a larger, more sophisticated, composite application. The three most important aspects of a Bean, are properties, methods, and events. Properties are named objects exposed by the bean so that its states and properties can be examined and/or manipulated by a component developer or other end-user of the bean. Events are the primary communication mechanism used by all Java components, including beans. The JavaBeans event model is the new, enhanced listener/sender event model provided by JDK 1.1. Beans can also 'export' public methods, which are no different than normal Java methods. These methods are primarily for use by other beans, or from scripting environments, such as JScript.

Development requirements

In order to get going developing beans, you are going to need the latest revision of the Sun JDK 1.1.3. In many aspects, the JavaBeans API is an extension of JDK 1.1, requiring many JDK 1.1 features such as the Core Reflection API (see EXE July 97), as well as the new improved listener/sender event model used by AWT. Second, you will need the latest JavaBeans development kit, or BDK. Both of these can be found by navigating the JavaSoft site (*http://www.JavaSoft.com*).

The most essential elements of the BDK are the JavaBeans specification, which detail all the aspects of basic JavaBeans development, the BeanBox application (the primary testing environment for beans), and a variety of sample source code. The BeanBox acts as a design-time development tool in which you can instantiate one or more beans, view and edit their properties via property sheets, and connect beans that are event sources (senders) to beans that are event consumers (listeners). This allows you to test the run-time dynamics and interaction of your beans. The sample code is a great place to get started and illustrates the most common aspects of bean development.

Primarily, beans are made up of properties, methods, and events. This is of course the short list of things that you will need to implement your bean. As it becomes more complex and/or you plan on 'shipping' your component to the rest of the world, you will probably want to add other JavaBeans related classes and features that I am not going to discuss in detail. For more information on the advanced topics, refer to the JavaBeans specification.

The components of the component

The first step in JavaBeans development is the conceptual design of the bean itself. This is an extremely important phase in the life of a bean, and you will save yourself a lot of trouble if you thoroughly specify what the bean is and what it is not. If you successfully complete this phase, it will be relatively easy to define the appropriate properties and their attributes. The results of this phase should give you a clear understanding of the event model that you will need to support your bean, as well as any public methods, or programmatic interface you want to provide.

The bean that I am designing and implementing is a simple timer which generates events at predetermined intervals. In addition to the basic timer functionality, I want `Timer` to provide a unique event sequence number and two extended program modes. The first mode, pulse mode, should generate one timer event (pulse) and stop. The second mode should generate alternating events, creating a cycle of high/low, on/off events.

Having conceptualised the functionality of the bean it is time to design the actual properties that will be exposed by the bean to represent that functionality:

```
private int timerMode ;
private long timerInterval ;
private boolean timerPhase ;
private boolean timerState ;
private long timerEventId ;
private String name ;
```

Before I describe the purpose of each, notice that all the properties are declared private. The only way to manipulate the properties will be by their public get/set (aka accessor) methods. All the properties will be read/write, with the exception of the `eventId` property, which is read-only, so the implementation will need to provide corresponding get/set functions. Another important point is that although I have declared instance variables of the form `timerXYZ`, the resulting property name will actually be `XYZ` because the accessor methods are declared `getXYZ`. If you remember last month's article, you should realize that Introspection will automatically synthesize a property name from the accessor methods, *not* the member variables.

The `mode` property will represent how the timer has been programmed: `standard`, `pulse`, or `phase`. The `interval` property represents the length between timer events, for example, 1000 milliseconds. The `phase` property indicates the current high/low, on/off when the timer is programmed in `phase` mode. The `state` property represents the current state of the timer, which can be `active`, or `paused`. The `eventId` property is read-only and represents the sequence number for the current event. Finally, the `name` property is a string that represents the instance name of a particular `Timer` bean. The name property is often derived from a parent class, such as `Component`. Our bean is a non-visible bean so we don't derive from any classes (such as `java.awt.Canvas`) that might derive directly or indirectly from `Component`. I provide this property in `Timer`. Although it is expected that

the user of the bean will provide a meaningful name, a unique name will be automatically generated ifone is not provided.

```
public int getMode() ;
public void setMode ( int mode ) ;
public long getInterval() ;
public void setInterval ( long interval ) ;
public boolean getState() ;
public void setState ( boolean state ) ;
public boolean getPhase() ;
public void setPhase ( boolean phase ) ;
public String getName() ;
public void setName ( String name ) ;
public long getEventId() ;
```

The declarations should be relatively straightforward and obvious, and I think you will find that the basic implementations are trivial. In all cases, the get accessor method returns the appropriate instance variable I described earlier. The set accessor methods are nearly as simple, usually being of the form, `timerXYZ = xyz`. One of the reasons that the implementation of the set accessor methods is so trivial is that they do little or no validation. You'll want to ensure your components are more robust before you send them out into the real world.

A source of events

Now that the property stuff is out of the way it is time to design and implement the event requirements of the `Timer` bean. `Timer` is an event source, generating events according to its programming. Anyone who is listening can act on those events. This implies two things, events must be generated, and secondly, we must maintain a list of listeners who want to receive event notifications.

The type of event that `Timer` will generate is the `ActionEvent`. This is a relatively generic event that is provided by AWT. Essentially the `ActionEvent` says, 'an action was performed', without specifying exactly what action. This functionality is perfect for `Timer` because anyone listening will know that the action that happened was a timer event (what else could it be?)

The `ActionEvent` has a corresponding listener interface, `ActionListener` which defines one method, `actionPerformed(ActionEvent e)`, `Timer` uses the `ActionListener` interface to propagate events to all the registered listeners. `ActionListener` is an interface and as such, does not provide the list management needed to keep track of registered listeners. Although a `vector` could be used to manage listeners, there is a much simpler way, `AWTEventMulticaster`. The class `AWTEventMulticaster` is provided as part of the `java.awt.event` package and is designed to remove all the headaches associated with maintaining lists of listeners, and propagating messages to them. `AWTEventMulticaster` implements the `ActionListener` interface, which makes managing and sending `Timer` action events a piece of cake.

```
private transient ActionListener
            timerActionListeners ;

public synchronized void
            addActionListener(ActionListener al)
{
  timerActionListeners =
   AWTEventMulticaster.add(timerActionListeners,al);
}

public synchronized void
            removeActionListener(ActionListener al)
{
  timerActionListeners =
    AWTEventMulticaster.remove
    (timerActionListeners,al);
}
```

The two functions `addActionListener` and `removeActionListener` will be revealed through Introspection, so other beans and the BeanBox will know that `Timer` can generate events of type `ActionEvent`. Note that the `timerActionListener` (and all other internal variables) are marked as `transient`. The `transient` modifier tells the serialization code not to save this variable when the bean is persisted.

`Timer` provides three methods that are specfically designed to be called programmatically:

```
public void reset();
public void pause();
public void activate();
```

The `reset()` and `activate()` methods are essentially the same function, both cause the timer state to become active. `pause()` does the opposite, putting the timer into a paused state. These functions are not actually required. The same functionality can be achieved via the `setState` accessor method. These are merely provided for demonstration.

Even though we have discussed the most important 'bean' aspects of `Timer` we still need to review all the details that tie everything together and make it work. First, we need a way to make `Timer` generate events based on timed intervals. For this, we use a `thread` object that will sleep for the specified timer interval and, when it wakes up, will determine if it is appropriate to generate an `ActionEvent`. Because `Timer` implements the `Runnable` interface, `Timer` also provides the code, `Timer.run()`, which implements this sleep/wake-up logic.

One static variable ('class' variable) `timerInstance` is used to help generate unique `Timer` bean instance names. Because it is static, this value is shared across all instances of `Timer`.

Loose ends

So the `Timer` bean is finally done and we are ready to run? Not quite, we still have a few details we need to take care of. First, although `Timer` is a 'non-visible' bean it would be nice if we had an iconic representation for use in the menus and toolbars of developer tools. The easiest way to do this is to provide a custom `BeanInfo` interface and provide an implementation of `getIcon()`. While providing this functionality is not complicated, it is a bit tedious to have to provide a default implementation for all the other `BeanInfo` methods. Fortunately there is a better way: `SimpleBeanInfo`. The JDK provides a `SimpleBeanInfo` class which does absolutely nothing (it doesn't need to because Introspection will figure it all out!). All that needs to be done is to create a `TimerBeanInfo` class that derives from `SimpleBeanInfo` and override the `getIcon()` method. All the other methods will return null, which tells Introspection to do its thing.

And finally, if you want to test `Timer` in the BeanBox, then it must be put into a JAR file and placed into the JARS directory within the BDK. The full listing can be downloaded from EXE OnLine or directly via FTP at *ftp.exe.co.uk/pub/exestuff/9709_Java*.

Although the `Timer` bean is relatively functional, there are quite a few JavaBeans specific things that I feel would need to be done (outside of reliability). Still, it is quite acceptable as a starting point, and it took less than 3 hours to develop and test. ■

Tom Guinther is a Software Architect for NuMega Technologies in Nashua NH, USA. He can be reached via e-mail at tomg@numega.com.

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Validating HTML

The era of Visual Notepad is over. With ever more graphical HTML editing tools in use, how can you be sure that your code is really up to the standard? According to Colin Hume, the answer is validation.

Authoring web pages was at one time a relatively simple process involving preparing HTML source using any convenient text editor, checking how pages looked with a browser and then deploying them on the Web. All that has changed, with the introduction of advanced HTML features such as ActiveX controls, Java applets, plug-ins and scripting languages. HTML editors have gone through a revolution too and some now offer graphical interfaces which isolate web page authors from the underlying HTML. Indeed, producing a web page no longer even needs a editor, any end-user can do it by using the 'Save as HTML' option in Microsoft Office 97 and similar products. The ease with which pages can be created has not, however, done away with the need to monitor the quality of the raw HTML code, to ensure that it is syntactically correct, and check it will work as intended across a range of browsers.

Previewing pages in the browser is not a substitute for validation. Most browsers will not generate error messages when they find basic errors such as incorrect nesting of tags, unmatched tags, or a missing required closing tag. And of course, by default, browsers will ignore unknown tags or attributes. This behaviour can cause unexpected problems. As an example, consider a web page with background colour `#FFFFFF` (white) and combine this with a table where the font colour is also set to white against a blue background – using the `BGCOLOR` attribute . This particular attribute was introduced by Microsoft in Internet Explorer 1.0 and is supported by Netscape Navigator but only in version 3.0 and higher. In Navigator 2.0 or earlier the text will be rendered as white on white, invisible.

Browser-specific extensions

Introducing endless new tags into HTML has been common practice since the time of Netscape 1.0, but it was never supposed to be that way. Tim Berners-Lee and CERN certainly did not envisage that this would be the case, but there are no inherent characteristics of HTML that prevent it. While browser-specific extensions to HTML continue to delight and exasperate web authors in equal measure, they have certainly transformed the Internet.

Such extensions are less of an issue in the context of the Intranet. By standardising on one browser it is possible to author web pages with no concern about the potential incompatibilities that would apply to an Internet site. While some of the potential problems caused by browser-specific extensions should disappear as the user base of older browsers shrinks, it cannot be assumed that newer browsers will eliminate the problem altogether. For example, Microsoft's latest browser is Pocket Internet Explorer – a version that runs under Windows CE. Not only does PIE not support key features of MSIE such as frames, it also differs in how tables are handled and there are some unsupported tags and attributes.

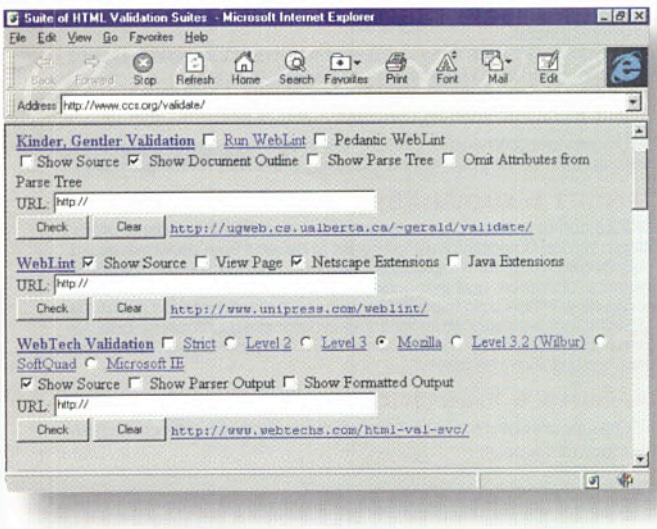

Figure 1 – A suite of online validation tools, a possible option.

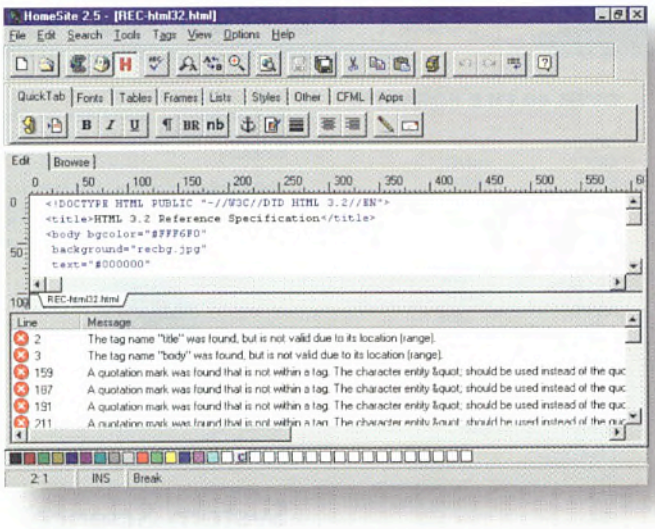

Figure 2 – HomeSite (and CSE 3310) – an HTML IDE?

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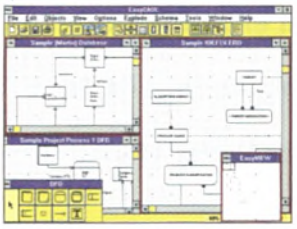

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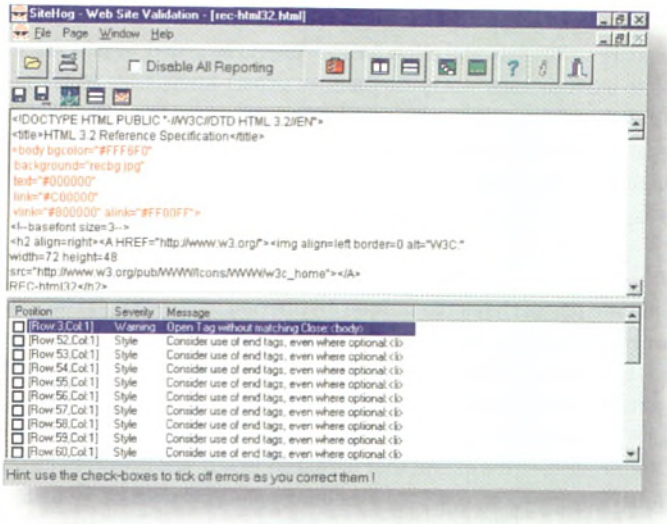

Figure 3 – SiteHog validates pages or sites.

A validation strategy

Unless you are possessed with an encyclopaedic knowledge of browser capabilities and HTML, a validation tool is the only way of making sure. You need a validation strategy that takes account of which HTMLs features are essential, which are desirable but not essential, and which are unimportant. This should be balanced by an evaluation of the implications of the strategy in terms of the current browser user base – some potentially useful data on this can be obtained from *http://www.browserwatch.iworld.com*. The data is indicative only of the browsers used to access this particular site. Not unsurprisingly it is dominated by the big two – Netscape Navigator and MSIE, and given the nature of the site perhaps over-states the share of the browser user base held by the newer releases of these products. That aside, what the information on the site does serve to emphasise is that the Internet spans a diverse range of platforms including the obvious ones such as the Mac, OS/2, Unix and the unlikely such as the Amiga.

A potential validation strategy is to adopt the HMTL 3.2 reference specification as standard and to eschew browser-specific extensions that have not been absorbed into it. There are some difficulties in doing this – Java applets and tables are in the current specification but ActiveX, frames, scripting languages and style sheets are not. Neither are some useful MSIE features such as the `FACE` attribute of the `<FONT>` tag. HTML 3.2 has had input from all the major vendors, and is a step towards reducing if not eliminating the fragmentation of HTML that has occurred. It is likely that some of the features currently missing from the present definition of HTML 3.2 will be included in future specifications. Equally, new releases from both Netscape and Microsoft and possibly other vendors are likely to add yet more browser-specific extensions so a standard HTML is unlikely ever to be achieved.

The absence of some important popular elements of HTML from 3.2 restricts the scope of a validation strategy but does not mean that functionality necessarily has to be lost. It is possible to adopt an HTML 3.2 plus frames strategy using the `<NOFRAMES>` tag (though it makes pages bigger). Similarly, an HTML 3.2 plus scripting language combination is possible, using the `<SCRIPT>` tag and comment tags to hide embedded scripts from non-compliant browsers, or the `<SCRIPT SRC>` construction. It is important to note that frames and scripting languages can involve some validation issues of their own. For instance HTML tags and attributes are normally case-insensitive but the values of the `NAME` attribute of the `<FRAME>` tag, specifically `_blank`, `_self`, `_parent` and `_top` must appear in lower case. Scripting languages can generate HTML on the fly through use of the `document.write` or `document.writeln` method, for example

```
Document.writeln("<img src=thisisa.gif height=109
width=225>")
```

which must be validated separately.

DTDs and the !DOCTYPE declaration

Opinions seem to differ about the relationship between HTML and SGML (see *SGML It's a beautiful day* in EXE February 1997 and *Generation X* in EXE June 1997). The view from the World Wide Web Consortium is that HTML is an instance or application of SGML, that a standardised Document Type Definition (DTD) as used in SGML should be adhered to, and that the DTD to which a web page conforms should be stated within the `!DOCTYPE` declaration that has been a feature of HTML since its inception. An alternative view is that HTML is only loosely based on SGML. Some cogent evidence in support of this is the status of the `!DOCTYPE` declaration in HTML. It is optional and even if it is present browsers interpret the page based on their own internal DTD not the one stated in the declaration. For this reason most web authors either leave it out entirely or accept whatever declaration and DTD reference their editor generates automatically.

While the behaviour of browsers hardly encourages use of the `!DOCTYPE` declaration, the opposite applies to some validation tools where both its presence and a correct statement of the DTD the web page is intended to conform to is a requirement. The `!DOCTYPE` declaration needs to appear as the first item on a web page, before the `<HTML>` tag. Its precise wording depends on the DTD. For HTML 3.2 it is:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2
Final//EN">
```

This is extracted from the HTML 3.2 Reference Specification, at *http://www.w3.org/TR/REC-html32.html*. As well as detailing the 3.2 specification and DTD, this document has some use as a general HTML reference.

Online validation

There are sites on the Internet that will validate HTML for a fee, and some where pages can be validated online without charge. Perhaps the best example of the later category is the suite of online validation tools which can be accessed at *http://www.ccs.org/validate/* (see Figure 1). Two of the tools on the site were tested – Kinder, Gentler Validation and Web Tech Validation.

The Kinder, Gentler Validation picked up the absence of the `!DOCTYPE` declaration in a test document, and as part of its error report explained its relevance and how to use it correctly. Rather unhelpfully it then validated the web page using an HTML 2.0 DTD generating as a result a long list of non-HTML 2.0 supported tags and attributes.

Web Tech Validation can be configured to various levels of HTML. It does not matter if the !DOCTYPE declaration is present or not, its does not report its absence. Web Tech's error reports are somewhat cryptic. When set to validate a document at Internet Explorer level it reported the `SIZE=+` attribute of the `<FONT>` tag as an error, which is incorrect.

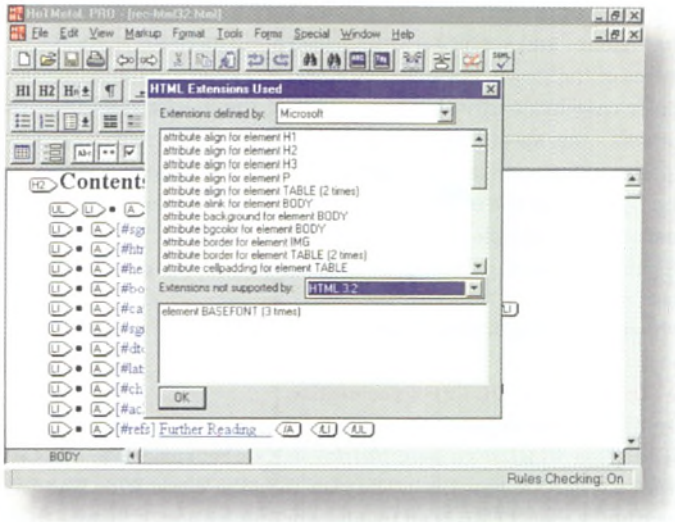

Figure 4 – SoftQuad HoTMetaL Pro reports only a summary of the errors found.

The disadvantage of this mode of validation is the cost involved, in terms of both connection and online charges. It can make sense if only small numbers of pages are involved and validation is required relatively infrequently.

While syntax checking and identifying the level of HTML to which a document conforms is the core of validation there are other considerations. For example the presence of the optional `HEIGHT` and `WIDTH` attributes to the `<IMG>` tag makes a fundamental difference to how a page is loaded particularly in conjunction with progressive graphics. The `ALT` attribute of the same tag is optional but should be present – partly for the benefit of users who configure browsers not to load graphics but also for users of text only browsers.

The validation tools tested

A sample of tools was tested, there are others but this selection was chosen to cover the current validation tool field as broadly as possible. As is now the rule the Internet is the best source of evaluation copies. Although not strictly a validation tool, a particularly useful HTML information source and resource is Stephen Le Hunte's *HTMLib HTML Reference Library* – this is available from a variety of sources including *http://hot.virtual-pc.com/htmlib*.

CSE 3310 HTML Validator

An evaluation version of CSE 3310 can be downloaded from *http://www.htmlvalidator.com* – the cryptic name is the code for the University computer science course attended by the author. The evaluation version is limited to checking 150 pages. It is 32-bit only. At around $35 to register with the author it is inexpensive. As well as running as a standalone validator, CSE 3310 will add validation checking to the HomeSite HTML editor.

For such a modestly priced product, CSE 3310 is extremely capable and highly configurable, allowing either a mixture of HTML categories or a single HTML category to be applied. A set of different configurations can be created if required. Cold Fusion tags are supported, and there is a facility to ignore the text between % delimited tags for server side scripting. There is a high degree of control over the validation process, for example over whether optional closing tags are present, tag nesting is checked and the presence of high ASCII characters. CSE 3310 will allow for new tags to be added, or new attributes to existing tags – this assumes an expert knowledge of HTML. Output from CSE 3310 can be directed to an editor of your choice, and there is a small but useful set of internal editing features such as switching source from lower to upper case or vice-versa, or stripping the tags from a file to leave just the text.

HomeSite 2.5/CSE 3310

HomeSite has perhaps the unique distinction of the only HTML editor around created by the author of a comic strip. The author was Nick Bradbury, who created HomeSite in response to a perceived lack of a reasonably priced but flexible and capable tool for generating web pages. HomeSite is rapidly gaining a reputation as the hottest HTML editor around, to the extent that in March 1997 it was acquired by the Allaire Corporation, the Cold Fusion people. A feature of HomeSite is the ability to add validation with CSE 3310, creating as near to an IDE as has yet been achieved with HTML. There are lots of neat little touches throughout the whole product including a colour syntax editor, frame and table wizards, an edit window with rulers and an internal browser based on MSIE 3.0. Other browsers can be specified for this purpose if required.

HomeSite can be downloaded from *http://www.allaire.com* and currently the price for registering it is $39.95. It remains to be seen how long HomeSite will stay at this price, as Allaire seems to be well aware of the potential of the product, and would probably like to pitch it at around the same price as HoTMetaL Pro or FrontPage 97.

SiteHog

SiteHog is a combined site management and HTML validation tool, from UK-based RedHog Software. An evaluation release of SiteHog can be downloaded from *http://www.compulink.co.uk/~allied-display/redhog*. This release only works on a local site, the registered version can access a remote site. The author of SiteHog, Dave Pellatt, is releasing a 'plus pack' for registered users which will include additional site-oriented tools A web page editor, inevitably called PageHog, is planned.

Currently the site management part of SiteHog extends to checking links, presenting a site graphically and estimated graphics download times. As a validation tool, SiteHog can be configured to a variety of different levels of HTML, such as 3.2, or to take account of the Netscape or Internet Explorer extensions. Ease of use is a particular feature of SiteHog. It currently costs around £50 to register. A professional version of SiteHog is scheduled for release that will allow user definable DTDs. With it, an organisation for example could adopt HTML 3.2 with Frames as a corporate standard, and validate all web pages against it.

The main feature of SiteHog is the quality and clarity of its reporting, and to some extent its site orientation makes more sense than a page-by-page approach to validation. Although SiteHog is site-oriented, you can check individual web pages if required.

SoftQuad HoTMetaL Pro

SoftQuad is a major player in SGML across all platforms which extends to supplying a Netscape/Internet Explorer plug-in as part of its Panorama Publisher product that allows a web browser to view SGML files. HoTMetaL Pro is a graphical HTML editor, with built-in validation. The problem with HoTMetaL Pro is the format of its validation reports – they are limited to a document summary without even line-number references. As a tool, HoTMetaL Pro is competent

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enough, it isolates users from the underlying HTML and includes its share of wizard-like tools for generating frames and tables. HoTMetaL Pro supports all of the current web page authoring paradigm including ActiveX, and Java applets but is now awkwardly positioned in market terms between the more technically oriented tools such as HomeSite and end-user tools such as FrontPage 97.

HoTMetaL Pro has no mechanism for inserting a `!DOCTYPE` declaration into a page, which is surprising given SoftQuad's background. There is no way either of adding it manually from within the editor because the HTML source cannot be accessed. For web page authors as opposed to end-users this is an irritation to say the least. A time-limited version of HoTMetal Pro can be downloaded from *http://www.sq.com/*.

The trend with all HTML tools seems to be to extend their capabilities, and in HoTMetaL's case this includes some site management utilities. These are useful, but the limitations of the reporting mean that validation remains one of HoTMetaL's weakest features. A potential workaround would be to use HoTMetaL in combination with one of the standalone validation tools.

Spyglass HTML Validator 1.0

Available as a free download from *http://www.spyglass.com*, the HTML Validator 1.0 is supplied with four DTDs. The Spyglass HTML Validator checks HTML pages strictly against the HTML DTD specified in the document's `!DOCTYPE` declaration. If the document does not contain a declaration, it resorts to a default DTD – the default can be configured from any of the four it is supplied with.

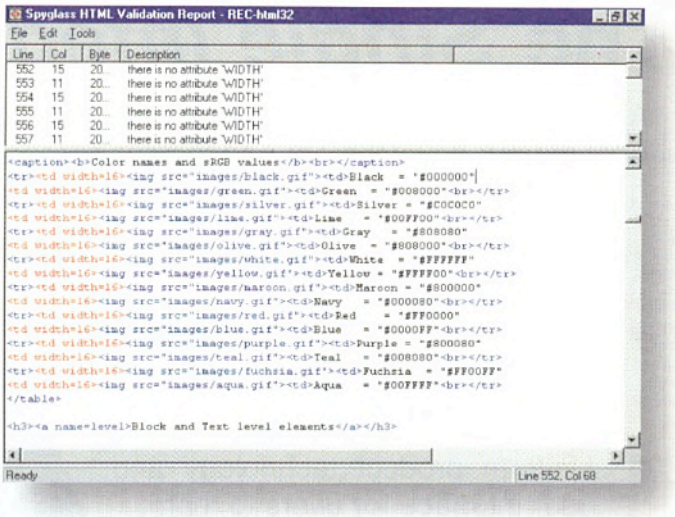

Figure 5 – The free Spyglass HTML Validator comes with four DTDs.

Spyglass released the Validator in 1996 and it has not been updated since. This is clear from the four DTDs supplied – one is for Internet Explorer 2.0 and the HTML 3.2 DTD is based on the draft proposal not the final recommendation. There is no DTD for any release of Netscape Navigator and neither is there one for Internet Explorer 3.0 or later. Validator's encouragement of the use of the `!DOCTYPE` declaration is laudable, but it needs a revision to incorporate more DTDs and possibly a configurable DTD as well. Aside

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from these restrictions, Spyglass Validator is a competent and useful tool and it is free.

Test results

A small suite of test files was used. This included a very large file of around 140 KB to test speed of processing. Lack of speed is not a significant factor with any of these tools – all loaded this file and processed it in a matter of seconds. The size of the file did slow down some of the validators when error reports were being accessed – SiteHog in particular although there was no problem with smaller and more representative HTML files.

Other elements tested for were:

- **The `!DOCTYPE` declaration**

None of the tools reported a missing declaration. When one was present, the Spyglass HTML Validator as already noted was the only tool that made any use of it. Some of the other tools – CSE 3310 and SiteHog but not HoTMetaL – provide the equivalent of a `!DOCTYPE` declaration through their configuration settings.

- **A range of syntax errors**

No problems here, on a file containing a range of HTML syntax and other errors including tag misspellings. CSE3310 has the advantage over the other tools of being configurable to ignore what would otherwise be reported as errors. For example, the use of the comment tags to comment out a line or section of otherwise valid HTML.

- **Missing `HEIGHT`, `WIDTH` or `ALT` attributes to the `IMG` tag**

SiteHog was the only tool that warned of the absence of `HEIGHT` and `WIDTH` attributes but it did not report on `ALT`.

- **HTML in embedded scripts**

To test whether the validators were checking the HTML in embedded scripts, a series of HTML errors were inserted into a section of JavaScript. Only the Spyglass HTML Validator picked up on this, reporting the `LANGUAGE` attribute of `<SCRIPT>` as unsupported, but still spotted all the errors in the HTML in the script. CSE did not detect errors but a visual indication was given by HomeSite's colour syntax highlighting.

And the first prize goes to...

Two of the tools tested stood out from the rest – CSE 3310 and SiteHog. The only significant disadvantage of CSE 3310 or the CSE/HomeSite combination is the page-orientation which makes validating an Internet or Intranet site of any size somewhat tedious. This is where SiteHog with its individual page and internal or external site validation scores. SiteHog will benefit from the extensions planned for it, particularly the ability to set and apply a specified validation strategy. For HomeSite users happy to validate on a page by page basis CSE is perhaps the obvious choice, but for users of other editors or where site validation is a must SiteHog is worthy of serious consideration. ■

Colin Hume is a journalist specialising in software.

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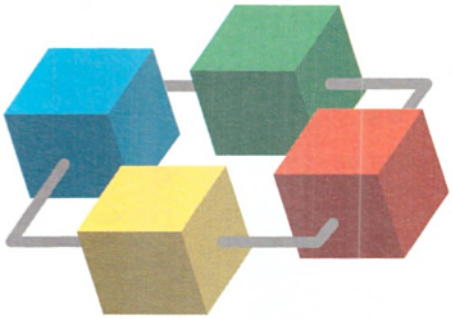

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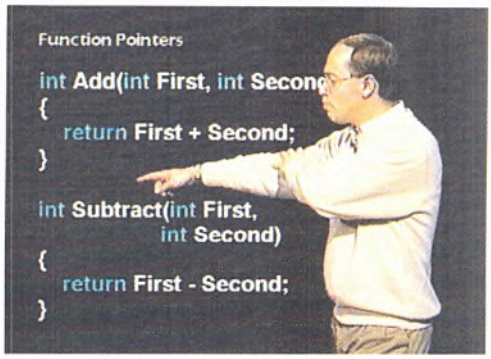

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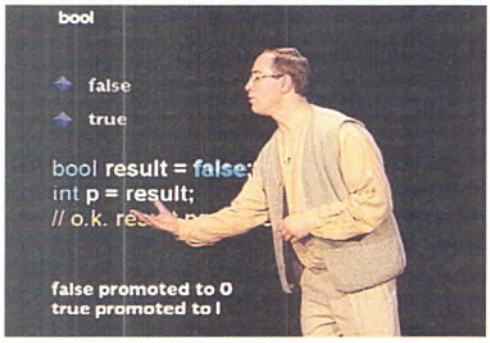

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ENQUIRY NO. S50

As if by magic?

Compilers have the last word when it comes to rewriting your code, but as Francis Glassborow reports, things can get very confusing when you're dealing with copies.

The 'as if' rule of C and C++ allows much liberty to compilers. A fully conforming compiler can apply any optimisation technique which produces behaviour that cannot be distinguished from that which a strict adherence to the programmer's code would generate. Let me give you some examples (all the variables in the following are initialised `int`s):

```
a = (b + c) - d;
```

We know that the compiler can evaluate (in this case look up addresses and fetch values) the terms of an expression in any order. It may not be clear that it can also evaluate the operations in any order. For example it could subtract `d` from `b`, then add `c`. It can do this because re-ordering cannot change the result. However if I write:

```
a = b*c/d;
```

it must generate code that will produce the same result as strictly multiplying `b` by `c` before dividing the result by `d`. Generally it must generate code to execute the operators from left to right in cases such as this. The number of possible optimisations is therefore severely limited. Consider:

```
a = b * 5 / 10;
```

Can the compiler code this as `a = b >> 1`? The answer is yes (`b*5` might overflow, but that would be, at best, indeterminate behaviour). So what about:

```
a = b / 5 * 10;
```

Can the compiler code this as '`a=b << 1`'? No. Try a few cases.

The 'as if' rule permits the compiler to replace possibly undefined or indeterminate behaviour by other behaviour of the same type or by less threatening behaviour. However fully defined behaviour must be identical to that intended by the programmer. The compiler has far less room for optimisation when dealing with floating point values. The exact order of additions and subtractions can dramatically change answers when dealing with floating point values and so the compiler has little room for maneuver.

One of the attractions of C is that a good compiler can legally reorganise code to produce faster, more compact executables. C++ needs to provide the same potential if it is to attract programmers who are writing code where it matters. However, there are two instances where C++ can have problems with the 'as if' rule: copying and copy assignment. Consider the following C code:

```
typedef struct {
   int i;
   int j;
} X;

X example ( X x) {
   x.i *= 2;
   x.j *= 2;
   return x;
};

int main() {
   X x = {1, 2};
   x = example(x);
   return 0;
}
```

Now a C compiler can eliminate (legally) almost all the code. It never needs to pass `x`. It can simply use the original because it knows exactly what is meant by copying (pass and return by value in this example is done by notional copying) and by assignment. Can we provide the same optimisation potential in C++? In this case yes, because there are no user defined functions (copy constructor, destructor or copy assignment). But what would we require if the same potential was allowed with user defined types that define one or more of copy construction, destruction and copy assignment?

To do this we need some way of specifying what we mean by copying. The best we can come up with is along the lines: 'A copy is something that does not change the program if the compiler chooses to make an apparently gratuitous one.' That definition is unacceptable in a standard. A group of us wanted a formulation that allowed the removal of a copy if the only subsequent use was a further copy or a destructor call.

This fell foul of the wishes of programmers who have developed idioms where the call of the destructor was critical. We spent hours trying to formulate a resolution for this problem. There were two main approaches. The first was to try to provide a mechanism by which programmers could inhibit suppression of calls to a copy constructor. The second choice was to try to define when it is safe to suppress copying. Andy Koenig had a potentially productive line based on considering the destructor. But time ran out.

We fell back on producing a list of specific circumstances where we were certain that removing a copy must be OK. The classic example of this is returning a local variable by value. This must be safe (think about it). However we failed to come up with a formulation to handle parameters. To understand why this matters you must consider the impact on forwarding functions. I would like to be able to demand that code such as:

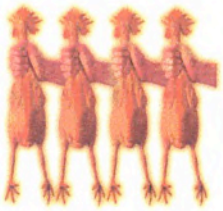
```
ostream & fn(Mytype, ostream &);
inline ostream & fn(ostream & out, Mytype const & mt)
   {return fn(mt, out);}
```

never generates an extra copy even if `mt` is a temporary because a conversion is required to provide a `Mytype` object. The words as currently written only allow this optimisation if the compiler can guarantee that this works 'as if' even for really bizarre user defined copying.

Ironically the safest way to get maximum optimisation of copying is to avoid providing a copy constructor, copy assignment or destructor. Of course this will not always be an option.

A sense of urgency

Despite the five 'No' votes on the current Committee Draft we expect to broker consensus by the end of the November meeting in New Jersey. There is a desire to deliver a C++ Draft International Standard. Even France, which has voted No most consistently, seems willing to compromise. As the French are the hosts for the March '98 meeting, they may prefer a celebration to a wake. What we have is far from perfect, and we will have a lot of work to do on defect reports over the next few years. But it is better than anyone was predicting four years ago.



Must buy

I am often asked 'How many C++ programmers are there?' I will soon have a way to answer that question. The third edition of *The C++ Programming Language* by Bjarne Stroustrup has just been published. It took the author and twelve technical reviewers three years. It is a complete rewrite and any serious C++ programmer will want to read it (more than once). It is the best £27.50 you will spend this year.

Last month's problem

Consider this code fragment:

```
. . .
int * a = (int *) malloc (sizeof(int));
puts("How many entries in the array?");
scanf("%i", a);
a = (int *)realloc(a, (a[0]+1)* sizeof(int));
. . .
```

Fortunately, the problem with this code is unlikely to appear in reality. It highlights a subtle problem that WG14/X3J11 decided not to fix. The C Standard Committees decided that some issues should be left as quality of coding ones — just as some are left as quality of implementation ones.

The problem is one of two that we recently found hiding in the Standard C Library. Most functions in the Standard C Library can be provided as macro functions (though there must always be a true function version as well). Unfortunately macro functions lack the two sequence points that true functions have. These guarantee that you cannot get the subtle forms of undefined behaviour that result from multiple writes to the same variable and/or order of evaluation while evaluating a single expression. To help you understand this, consider the difference between:

```
#define INCR(x)  ++x
```

applied to:

```
  i = i + INCR(i);     /* undefined behaviour, */
                       /* i written twice */
```

and

```
int incr( int * i) { return i++; }
```

called in:

```
  i = i + incr(&i) ;   /* silly, but OK */
```

Experienced programmers know that they can suppress the macro substitution by putting the function name in brackets. Technically the `realloc` in the code above could be a macro. That might be implemented in a way that triggers an order of evaluation problem. I know it seems hard, in this case, to construct a reasonable implementation that would suffer from this problem. However, remember that library implementors often hide clever code behind macro functions. If you want to protect yourself against being bitten you wrap library names in brackets whenever one of the arguments is the address of an object that is reused in the same expression. The critical line above should be:

```
a = (int *)(realloc)(a, (a[0]+1)* sizeof(int));
```

Note that it is exactly these subtle defects that are hardest to find when they occur.

The other problem, one we decided to fix, was the order of use of write-back parameters in Standard C Library functions. Consider:

```
  int i=0;
  double value = 2.3;
  printf("The value is%n %f%n\n ", &i, value, &i);
```

What is the value in `i` after executing this code? Is it even defined? The surprising answer is that it might be undefined behaviour by the rules of C89. There is no requirement in the C89 Standard for a sequence point between writes to objects pointed to by function parameters in Standard C Library functions. C9X will require both that there be sequence points and that the implementation shall write to the objects in the order of the pointer arguments. This will not protect you if you insist on writing code such as:

```
void path(int * first, int * second, int value){
  *first = (*second = value) + 1;
}
```

and then call it with:

```
  int i;
  path(&i, &i, 1);
```

The undefined nature of the result is your fault. You need to take particular care when your function includes two pointer (or reference) parameters because there is always a risk that the user may provide addresses that are the same.

An apology

I owe Ira Pohl an apology for misquoting his code and so turning it from poor but legal code to illegal code. The first line of his `string::concat` function should have been:

```
char temp = new char[a.len + b.len + 1];
```

Note that among the other faults in Pohl's original code is that his function leaks memory. He neither deletes `temp` nor relays its value out of the function.

My thanks to Jon Jagger for drawing my attention to this. He also drew my attention to a subtle bug hiding in my alternative code. This bug relates to exception handling and is the kind that is likely to infect quite a bit of code. I have set it as this month's problem.

This month's problem

What is wrong with the following code that results in a fault if an exception is thrown from within the `try` block?

```
void my_string::concat(const my_string & a, const
my_string & b){
  len = a.len + b.len;
  try {
    char * temp = new char[len + 1];
    strcpy(temp, a.s);
    strcat(temp, b.s);
    delete [] s, s = temp;
  }
  catch(bad_alloc ba) {
    cout << "Out of memory in string::concat, no
                                    changes made"
         << endl;
    throw ba; // rethrow for user handler
  };
}
```

■

Associations of C/C++ Users subscriptions: individual £15, student £7.50, corporate £80, Overload & C++ SIG £30 (including ACCU membership). For further information and application forms write to Francis Glassborow, 64 Southfield Road, Oxford, OX4 1PA, call 01865 246490 or email francis@robinton.demon.co.uk

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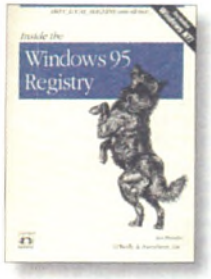
ENQUIRY NO. S52

Inside the Windows 95 Registry reviewed by Gavin Smyth



This book discusses the use of the Windows 95 registry: how it is accessed via utilities such as Control Panel applets or RegEdit (which is described in almost painful detail), including backup procedures, as well as programmatically. Although the author takes pains to state that it is in no way intended to be a listing of the contents of a typical registry, he does include a few common entries and conventions. It concentrates mainly on the Windows 95 registry, but the techniques can be applied to Windows NT and Petrusha points out differences between the Windows 95 and Windows NT registries.

Accessing the registry by API call is explained for several different environments: via C under Win32, Win16, DOS and from within a VxD. These sections are quite similar, though the author highlights where not paying attention to the small differences causes problems, and where the Microsoft help files are incorrect. Accessing the registry from Visual Basic is allocated a few chapters: he dismisses VB's rather inflexible intrinsic functions rapidly, discusses importing the Win32 API, building up to the use of a commercial OCX, a restricted version of which is supplied on the accompanying floppy disk – am I the only person who dislikes books trying to sell me things in this way?

Having covered the various ways of manipulating the registry, Petrusha brings up registry content conventions, and explains a few spying tools, also on the book's companion floppy. I found this section most illuminating.

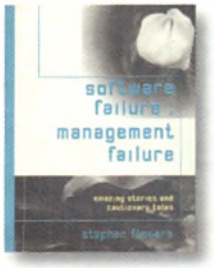
The book closes by describing a small part of an application which uses the registry as a private database. It shows how this was converted from using INI files. The chapter reads as an advert for another book: at least it was a short chapter. In fact, there are quite a lot of cross-references to other O'Reilly books – could this be a conspiracy?

There are many repetitions: something mentioned in passing in one chapter might appear in its own expanded section later, or some tip might crop up in several chapters. The book tends to swing between very basic and much more complex levels: it is somewhat disconcerting to find, in the middle of a reasonably complex explanation, a note to the effect that C macros are case-sensitive. There is a significant amount of information that I feel is irrelevant to the subject matter suggested by the title of the book: for example, there are over 30 pages explaining how to call DLL functions from Visual Basic. However, the pages left after throwing away this sort of padding are still worth buying the book for.

✓ ***Verdict:*** *Overall recommended.*

Title:	*Inside the Windows 95 Registry*
Author:	*Ron Petrusha*
Publisher:	*O'Reilly and Associates*
ISBN:	*1-56592-170-4*
Price:	*£25.70*
Pages:	*575*

Software Failure: Management Failure reviewed by Mary Hope



You have read the books that tell you how to manage projects and deliver the right goods at the right time. Now read about the Information Systems managers who did not follow all this good advice and ended up with serious egg on their face. As the title suggests this is a book about software projects that went wrong. Most of the case studies went wrong in the sense that they cost many millions of pounds and delivered nothing. For instance, PROMS (The Performing Rights Society project) had soaked up £11 million when suspended but this looks modest next to Taurus, the doomed Stock Exchange project, which absorbed £75 million. Others, like the London Ambulance Service, may only have cost a bit over a million pounds but in human terms were a dreadful disaster. The other major commercial case study described in the book is the American Airlines et al computer reservation system called Confirm; approximate cost – £142 million.

A chapter on government IS disasters describes one UK experience (the Wessex Regional Information Systems Plan) and two American. As the author acknowledges companies are reticent to flaunt the details of failure, but generally, there is enough evidence to get a feel for what went wrong.

Of course, the point of the book is not just to provide a voyeuristic gloat but to try and draw some lessons about why large software development projects go wrong. So while the bulk of the book consists of descriptive case studies the final chapter draws this together with a list of 'Critical Failure Factors'. These include organisational issues, management issues and failure factors at the initiation, analysis and design, development and implementation phases. The level of analysis is not deep but does provide some food for thought.

The book is very clearly aimed at managers rather than technical developers. The message is that projects fail because of poor management rather then poor technology. In general, the absence of technical detail is understandable as the author wishes to highlight management inadequacies. But in some instances, the choice of technology looks to be relevant and more detail would fill out the picture. For instance the London Ambulance Service application, circa 1991, was to be developed using Windows 3.0 and the first version of Visual Basic and run on 25 MHz workstations! The author does not seem totally at ease when describing the technology.

In general while IS managers come out of these case studies as showing extreme degrees of incompetence, IT specialists fare only slightly better. We are portrayed as being keen to protect the mystique and technology driven but unable to recognise our limitations.

This is a book that software engineers should read. Just as committed Guardian readers should occasionally read the Telegraph to see the other perspective (and vice versa), so this book will remind the technologists of the importance of the organisational, cultural, political and management aspects of IS projects. After reading this book you can feel justified in blaming the management if your project is not delivered on time, at cost and to requirements!

✓ ***Verdict:*** *A good read.*

Title:	*Software Failure: Management Failure*
Author:	*Stephen Flowers*
Publisher:	*John Wiley*
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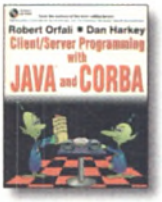

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Introduction to Internet/Intranet for Business	Monthly	4	£1375	London	LTREE
Developing a Web Site	Monthly	4	£1375	London	LTREE
Designing an Intranet	Monthly	4	£1375	London	LTREE
Internet and System Security	Monthly	4	£1375	London	LTREE
Deploying Internet and IntranetFirewalls	16/12/97	4	£1375	London	LTREE
Netscape Suitespot Servers	Monthly	4	£1375	London	LTREE
Java for Multimedia Applications Dvlpmnt	Monthly	4	£1375	London	LTREE
LANGUAGES					
Basic Java	01/07/97	1	£39.95	Your site	N-ARY
Advance Java	01/07/97	1	£39.95	Your site	N-ARY
Java Server API	01/08/97	1	£39.95	Your site	N-ARY
JDBC	01/08/97	1	£39.95	Your site	N-ARY
JavaBeans	01/09/97	1	£39.95	Your site	N-ARY
HTML	01/08/97	1	£39.95	Your site	N-ARY
Object Orientation	01/07/97	1	£39.95	Your site	N-ARY
C Primer	To Suit	2	£550	London	QA TR
	To Suit	2	£550	Cirencester	QA TR
C++ Primer	To Suit	2	£595	London	QA TR
	To Suit	2	£595	Cirencester	QA TR
Programming with JavaScript	To Suit	2	£625	London	QA TR
	To Suit	2	£625	ThamesVal	QA TR
Fundamentals of MicrosoftVisual Basic 4.0	8/9/97	3	£795	London	PYGM
	6/10/97	3	£795	London	PYGM
	10/11/97	3	£795	London	PYGM
Client/Server development: Visual Basic & SQL server	24/9/97	3	£950	London	PYGM
	27/10/97	3	£950	London	PYGM
	19/11/97	3	£950	London	PYGM
C Programming	To Suit	4	£1135	London	QA TR
	To Suit	4	£1135	Cirencester	QA TR
	To Suit	4	£1135	ThamesVal	QA TR
	To Suit	4	£1135	North West	QA TR
C++ for C Programmers	To Suit	4	£1135	London	QA TR
	To Suit	4	£1135	Cirencester	QA TR
	To Suit	4	£1135	ThamesVal	QA TR
	To Suit	4	£1135	North West	QA TR
	To Suit	4	£1135	Edinburgh	QA TR
Java for C/C++ Programmers	To Suit	4	£1175	London	QA TR
	To Suit	4	£1175	Cirencester	QA TR
	To Suit	4	£1175	ThamesVal	QA TR
	To Suit	4	£1175	Glasgow	QA TR
Advanced Programming in Visual Basic 4.0	18/8/97	5	£1195	London	PYGM
Fundamentals of Visual Basic 5.0	18/8/97	5	£1195	London	PYGM
Mastering Visual Basic 5.0 Advanced	26/8/97	4	£1195	London	PYGM
Fundamentals of Visual Basic 5.0	1/9/97	5	£1195	Manchester	PYGM
	8/9/97	5	£1195	London	PYGM
Mastering Visual Basic 5.0 Advanced	15/9/97	5	£1195	London	PYGM
	15/9/97	5	£1195	Manchester	PYGM
Visual Basic 5.0 - Advanced Techniques Workshop	22/9/97	5	£1195	London	PYGM
	29/9/97	5	£1195	Manchester	PYGM
Fundamentals of Visual Basic 5.0	6/10/97	5	£1195	London	PYGM
Mastering Visual Basic 5.0 Advanced	13/10/97	5	£1195	London	PYGM
Advanced Programming in Visual Basic 4.0	13/10/97	5	£1195	London	PYGM
Visual Basic 5.0 - Advanced Techniques Wksh	20/10/97	5	£1195	London	PYGM
Fundamentals of Visual Basic 5.0	3/11/97	5	£1195	Manchester	PYGM
Mastering Visual Basic 5.0 Advanced	10/11/97	5	£1195	Manchester	PYGM

Course	Date	Days	Cost	Place	Company
Fundamentals of Visual Basic 5.0	10/11/97	5	£1195	London	PYGM
Mastering Visual Basic 5.0 Advanced	17/11/97	5	£1195	London	PYGM
Advanced Programming in Visual Basic 4.0	17/11/97	5	£1195	London	PYGM
Visual Basic 5.0 - Advanced Techniques Workshop	24/11/97	5	£1195	London	PYGM
	24/11/97	5	£1195	Manchester	PYGM
Fundamentals of Visual Basic 5.0	8/12/97	5	£1195	London	PYGM
Fundamentals of Visual Basic 5.0	15/12/97	5	£1195	Manchester	PYGM
Mastering Visual Basic 5.0 Advanced	15/12/97	5	£1195	London	PYGM
Advanced C	To Suit	4	£1195	London	QA TR
	To Suit	4	£1195	Cirencester	QA TR
C++ for non-C Programmers	To Suit	5	£1195	London	QA TR
	To Suit	5	£1195	Cirencester	QA TR
Advanced C++ Development Techniques	To Suit	4	£1195	London	QA TR
	To Suit	4	£1195	Cirencester	QA TR
	To Suit	4	£1195	ThamesVal	QA TR
Java for non-C Programmers	To Suit	5	£1245	London	QA TR
	To Suit	5	£1245	Cirencester	QA TR
	To Suit	5	£1245	ThamesVal	QA TR
Delphi 2.0 Client / Server Development	18/8/97	5	£1320	London	PYGM
	15/9/97	5	£1320	London	PYGM
	20/10/97	5	£1320	London	PYGM
	3/11/97	5	£1320	Manchester	PYGM
	17/11/97	5	£1320	London	PYGM
	8/12/97	5	£1320	Manchester	PYGM
	15/12/97	5	£1320	London	PYGM
MFC Programming Fundamentals	26/8/97	4	£1395	London	PYGM
Mastering Visual C++ 5	1/9/97	5	£1395	London	PYGM
Intermediate Windows-Based MFC Progr	1/9/97	5	£1395	London	PYGM
Intro: Visual C++ and Object-Oriented Programming	1/9/97	5	£1395	Manchester	PYGM
	8/9/97	5	£1395	London	PYGM
MFC Programming Fundamentals	15/9/97	5	£1395	Manchester	PYGM
Mastering Visual J++	22/9/97	5	£1395	London	PYGM
MFC Programming Fundamentals	29/9/97	5	£1395	London	PYGM
Intermediate Windows-Based MFC Programming	29/9/97	5	£1395	Manchester	PYGM
	13/10/97	5	£1395	London	PYGM
Mastering Visual C++ 5	13/10/97	5	£1395	London	PYGM
Mastering Visual J++	13/10/97	5	£1395	Manchester	PYGM
Intro: Visual C++ and Object-Oriented Progr	27/10/97	5	£1395	London	PYGM
Mastering Visual J++	27/10/97	5	£1395	London	PYGM
MFC Programming Fundamentals	3/11/97	5	£1395	London	PYGM
Mastering Visual C++ 5	10/11/97	5	£1395	London	PYGM
Intermediate Windows-Based MFC Progr	10/11/97	5	£1395	London	PYGM
Mastering Visual J++	1/12/97	5	£1395	London	PYGM
Intro: Visual C++ and Object-Oriented Progr	1/12/97	5	£1395	London	PYGM
MFC Programming Fundamentals	8/12/97	5	£1395	London	PYGM
Intro: Visual C++ and Object-Oriented Progr	8/12/97	5	£1395	Manchester	PYGM
Mastering Visual C++ 5	15/12/97	5	£1395	London	PYGM
Intermediate Windows-Based MFC Progr	15/12/97	5	£1395	London	PYGM
Advanced Java Development	To Suit	5	£1395	London	QA TR
	To Suit	5	£1395	Cirencester	QA TR
	To Suit	5	£1395	ThamesVal	QA TR
MANAGEMENT					
Certified Software Manager	01/10/97	1	£399	London	COMC
	20/10/97	1	£399	London	COMC
	14/10/97	1	£399	Swindon	COMC
	21/11/97	1	£399	Birmingh	COMC
	05/11/97	1	£399	London	COMC
	03/12/97	1	£399	Swindon	COMC
Teambuilding Skills	Monthly	3	£1085	London	LTREE
Management Skills for IT Professionals	Monthly	4	£1375	London	LTREE
Influence Skills	Monthly	4	£1375	London	LTREE
Effective Communication Skills	Monthly	3	£1375	London	LTREE
Finance forNon-Financial Managers	09/12/97	4	£1375	London	LTREE
Business Process Re-engineeering	Monthly	4	£1375	London	LTREE
NETWARE					
NetWare Service and Support	Monthly	4	£1375	London	LTREE
Intranetware:NetWare 4.xAdministration	Monthly	5	£1595	London	LTREE
NETWORKS					
Distributed Security Techniques and Issues	15/8/97	1	£330	London	PYGM
Wide AreaNetworking & Telecommunications	05/08/97	4	£1375	London	LTREE
Wide Area NetworkTroubleshooting	Monthly	4	£1375	London	LTREE
Hands-on LAN Troubleshooting	Monthly	4	£1375	London	LTREE
High Performance Ethernet	Monthly	4	£1375	London	LTREE
FastLAN Technologies	Monthly	4	£1375	London	LTREE
High Performance Cabling Systems	25/11/97	4	£1375	London	LTREE
Introduction to Internetworking	09/12/97	4	£1375	London	LTREE
IP Routing with OSPF and BGP	03/10/97	4	£1375	London	LTREE
CiscoRouters: Introduction	Monthly	4	£1375	London	LTREE
Introduction to Datacomm & Networks	Bi-weekly	4	£1375	London	LTREE
Local AreaNetworks	Monthly	4	£1375	London	LTREE
Hand-on PCNetworking	Monthly	4	£1375	London	LTREE
	07/10/97	4	£1375	Edinburgh	LTREE
Data Network Design and Optimisation	Monthly	4	£1375	London	LTREE
SNMP: From Workgroup to Enterprise Netwk	14/10/97	4	£1375	London	LTREE
Utilising Frame Relay Networks	11/11/97	4	£1375	London	LTREE

Course	Date	Days	Cost	Place	Company
OBJECT ORIENTED TECHNOLOGY					
Introduction to ObjectTechnology	Monthly	4	£1375	London	LTREE
	23/09/97	4	£1375	Edinburgh	LTREE
Object-Oriented Analysis and Design	6/10/97	5	£1595	Birmingh	LTREE
	01/12/97	5	£1595	Edinburgh	LTREE
Building Object-Oriented Applications with PowerBuilder V5	To Suit	3	£995	London	QA TR
Building Object-Oriented Applications with PowerBuilder V5	To Suit	3	£995	Cirencester	QA TR
Overview of Distributed Objects	To Suit	1 day	£295	London	QA TR
Object-Oriented Technology Primer	To Suit	1 day	£295	London	QA TR
Overview of the Unified Modelling Language	To Suit	1 day	£295	London	QA TR
	To Suit	1 day	£295	Cirencester	QA TR
Moving to the Unified Modelling Language	To Suit	2	£675	London	QA TR
	To Suit	2	£675	Cirencester	QA TR
Object-Oriented Design Patterns	To Suit	2	£675	London	QA TR
	To Suit	2	£675	Cirencester	QA TR
Developing CORBA Applications	To Suit	3	£965	London	QA TR
Object-Oriented Software Development	To Suit	3	£965	London	QA TR
	To Suit	3	£965	Cirencester	QA TR
Object-Oriented Detailed Design	To Suit	3	£995	London	QA TR
Object-Oriented Analysis and Design using the Booch Method	To Suit	4	£1195	London	QA TR
Object-Oriented Analysis and Design using the Unified Modelling Language	To Suit	5	£1395	London	QA TR
	To Suit	5	£1395	Cirencester	QA TR
	To Suit	5	£1395	ThamesVal	QA TR
Object-Oriented Analysis and Design using Rumbaugh's OMT	To Suit	5	£1395	London	QA TR
	To Suit	5	£1395	Cirencester	QA TR
Object-Oriented Analysis and Design	Monthly	5	£1595	London	LTREE
PC SUPPORT					
PC Configuration and Troubleshooting	Bi-weekly	4	£1375	London	LTREE
	28/10/97	4	£1375	Birmingh	LTREE
	Monthly	4	£1375	Edinburgh	LTREE
Advanced PC Configuration	Monthly	4	£1375	London	LTREE
PROGRAMMING					
Installing and Supporting Microsoft Office 97	COMC	1	POA	London	COMC
Delphi 3 Power	17/11/97	5	POA	Painswick	DPR
Delphi Fundamentals	01/09/97	5	POA	Painswick	DPR
	06/10/97	5	POA	Painswick	DPR
	03/11/97	5	POA	Painswick	DPR
	01/12/97	5	POA	Painswick	DPR
Delphi Languages	22/09/97	3	POA	Painswick	DPR
Visual Basic Advanced v.4	24/09/97	2	POA	Painswick	DPR
	12/11/97	2	POA	Painswick	DPR
Visual Basic Advanced v.5	22/10/97	3	POA	Painswick	DPR
	08/12/97	3	POA	Painswick	DPR
Visual Basic Fundamentals	03/11/97	5	POA	Painswick	DPR
Visual Basic Fundamentals v.4	08/09/97	5	POA	Painswick	DPR
Visual Basic Fundamentals v.5	29/09/97	5	POA	Painswick	DPR
	01/12/97	5	POA	Painswick	DPR
Visual Basic Upgrade v.3-4	20/10/97	3	POA	Painswick	DPR
	11/12/97	2	POA	Painswick	DPR
Visual Basic Upgrade v.4-5	22/09/97	2	POA	Painswick	DPR
	10/11/97	2	POA	Painswick	DPR
Visual Fox Pro Fundamentals	27/10/97	5	POA	Painswick	DPR
Basic Java	01/07/97	1	£39.95	Your site	N-ARY
Advance Java	01/07/97	1	£39.95	Your site	N-ARY
Java Server API	01/08/97	1	£39.95	Your site	N-ARY
JDBC	01/08/97	1	£39.95	Your site	N-ARY
JavaBeans	01/09/97	1	£39.95	Your site	N-ARY
HTML	01/08/97	1	£39.95	Your site	N-ARY
Object Orientation	01/07/97	1	£39.95	Your site	N-ARY
MS Office 97 Development Environment - Seminar	03/10/97	½	£70	London	COMC
	19/12/97	½	£70	London	COMC
Creating Workgroup Solutions in Microsoft Outlook 97 - Seminar	03/10/97	½	£70	London	COMC
	19/12/97	½	£70	London	COMC
Word Basic Programming	30/10/97	1	£235	Bristol	COMC
	13/10/97	1	£235	Glasgow	COMC
	28/11/97	1	£235	London	COMC
	05/12/97	1	£235	Birmingh	COMC
Microsoft Visual Basic V4 Primer	To Suit	1 day	£295	London	QA TR
	To Suit	1 day	£295	Cirencester	QA TR
	To Suit	1 day	£295	ThamesVal	QA TR
	To Suit	1 day	£295	North West	QA TR
Microsoft Visual Basic V5 Primer	To Suit	1 day	£295	London	QA TR
	To Suit	1 day	£295	Cirencester	QA TR
VBA 5 Programming in Microsoft Excel 97	16/10/97	2	£470	London	COMC
	22/12/97	2	£470	London	COMC
VBA 5 Programming in Microsoft Access 97	08/12/97	2	£470	London	COMC
Moving to Visual Basic Version 5	To Suit	2	£625	London	QA TR
Programming with Visual Basic Script	To Suit	2	£625	London	QA TR
	To Suit	2	£625	Cirencester	QA TR
	To Suit	2	£625	ThamesVal	QA TR
WOSA	29/9/97	3	£995	London	PYGM
	27/10/97	3	£995	London	PYGM
	1/12/97	3	£995	London	PYGM
Client/Server Programming with	To Suit	4	£1245	London	QA TR
Visual Basic Enterprise Edition	To Suit	4	£1245	Cirencester	QA TR
Advanced Client/Server Programming with Visual Basic V5	To Suit	4	£1245	London	QA TR
	To Suit	4	£1245	Cirencester	QA TR
UNIX Programming	To Suit	5	£1295	London	QA TR
	To Suit	5	£1295	Cirencester	QA TR
Hands-on Visual Basic5	Monthly	4	£1375	London	LTREE
Microsoft Access Programming	Monthly	4	£1375	London	LTREE
Win32 GUI Programming	02/12/97	4	£1375	London	LTREE
Advanced Windows Programming with MFC	11/11/97	4	£1375	London	LTREE
TCP/IP Programming	25/11/97	4	£1375	London	LTREE
JavaProgramming	Monthly	4	£1375	London	LTREE
Java for Enterprise Systems	Monthly	4	£1375	London	LTREE
Java for C++ Prgrammers	Monthly	4	£1375	London	LTREE
VisualJ++	25/11/97	4	£1375	London	LTREE
PerlProgramming	Monthly	4	£1375	London	LTREE
KornShell PRogramming	Monthly	4	£1375	London	LTREE
Introduction toProgramming	Monthly	4	£1375	London	LTREE
C Programming	Monthly	4	£1375	London	LTREE
C Advanced Programming	Monthly	4	£1375	London	LTREE
Introduction to C++ for Non-C Programmers	Monthly	4	£1375	London	LTREE
C++ Object-Oriented Programming	Monthly	4	£1375	London	LTREE
Windows Architecture	29/9/97	5	£1395	London	PYGM
	6/10/97	5	£1395	Manchester	PYGM
	27/10/97	5	£1395	London	PYGM
	1/12/97	5	£1395	London	PYGM
	15/12/97	5	£1395	Manchester	PYGM
Programming the Microsoft Active Server	To Suit	5	£1495	London	QA TR
	To Suit	5	£1495	Cirencester	QA TR
Building Apps with MS Transaction Server	To Suit	5	£1495	London	QA TR
	To Suit	5	£1495	Cirencester	QA TR
Visual C++: Windows Programming with MFC	27/10/97	5	£1595	London	LTREE
PROJECT MANAGEMENT					
Object-Oriented Project Management	To Suit	2	£675	London	QA TR
Object-Oriented Project Management	To Suit	2	£675	Cirencester	QA TR
DSDM Practitioner	To Suit	3	£895	London	QA TR
	To Suit	3	£895	Cirencester	QA TR
Managing Client/Server Software Development Projects	To Suit	3	£995	London	QA TR
	To Suit	3	£995	Cirencester	QA TR
Project Management Skills	0101/00	4	£1195	London	QA TR
Software Project Planning and Management	18/11/97	4	£1375	London	LTREE
Project Management: Skills for Success	Monthly	4	£1375	London	LTREE
SYSTEMS					
Implementing the Year 2000 Conversion	Monthly	3	£1085	London	LTREE
SYSTEMS ANALYSIS					
Software Quality Assurance	Monthly	4	£1375	London	LTREE
Software Systems Analysis and Design	09/12/97	4	£1375	London	LTREE
SYSTEMS MANAGEMENT					
Hands-on Microsoft Exchange	Monthly	4	£1375	London	LTREE
Microsoft Exchange 5 Server Administration	Monthly	4	£1375	London	LTREE
Windows OpenSystems Architecture	18/11/97	4	£1375	London	LTREE
Building Office 97 Intranet Applications	Monthly	4	£1375	London	LTREE
Supporting Systems Management Server 1.2	1/9/97	5	£1450	London	PYGM
	6/10/97	5	£1450	London	PYGM
	13/10/97	5	£1450	Manchester	PYGM
	17/11/97	5	£1450	London	PYGM
	15/12/97	5	£1450	London	PYGM
UNIX					
UNIX: Hands-on Introduction	Monthly	4	£1375	London	LTREE
UNIX System and Network Security	Monthly	4	£1375	London	LTREE
UNIX Workstation Administration	11/11/97	4	£1375	London	LTREE
UNIX ServerAdministration	Monthly	4	£1375	Edinburgh	LTREE
UNIX Programming	25/11/97	4	£1375	London	LTREE
WINDOWS					
Windows 95 Technical Overview	29/8/97	1	£330	London	PYGM
	23/9/97	1	£330	London	PYGM
	28/10/97	1	£330	London	PYGM
	11/11/97	1	£330	Manchester	PYGM
	12/12/97	1	£330	London	PYGM
Supporting Windows 95	22/9/97	5	£1295	Manchester	PYGM
	22/9/97	5	£1295	London	PYGM
	27/10/97	5	£1295	London	PYGM
	27/10/97	5	£1295	London	PYGM
	17/11/97	5	£1295	London	PYGM
	17/11/97	5	£1295	Manchester	PYGM
	17/11/97	5	£1295	London	PYGM
	17/11/97	5	£1295	Manchester	PYGM
	15/12/97	5	£1295	London	PYGM
Supporting Windows 98	15/12/97	5	£1295	London	PYGM
Integrating Microsoft Office 97:Hands-On	Monthly	4	£1375	London	LTREE
Hands-On TCP/IP Internetworking on Windows NT	Monthly	4	£1375	London	LTREE
Windows Programming in C	To Suit	5	£1395	Cirencester	QA TR

Course	Date	Days	Cost	Place	Company
Windows Programming with Visual C++ & the MFC Library	To Suit	5	£1395	London	QA TR
	To Suit	5	£1395	Cirencester	QA TR
	To Suit	5	£1395	ThamesVal	QA TR
	To Suit	5	£1395	North West	QA TR
Win32 Programming Essentials	To Suit	5	£1395	London	QA TR
	To Suit	5	£1395	Cirencester	QA TR
	To Suit	5	£1395	ThamesVal	QA TR
Windows OLE Programming with the MFC Library	To Suit	5	£1395	London	QA TR
	To Suit	5	£1395	Cirencester	QA TR
Windows Programming in C	To Suit	5	£1395	London	QA TR
Developing ActiveX Controls	To Suit	5	£1395	London	QA TR
Developing ActiveX Controls	To Suit	5	£1395	Cirencester	QA TR
Windows OLE System Programming	To Suit	5	£1495	London	QA TR
	To Suit	5	£1495	Cirencester	QA TR
Windows 95 Support and Networking	Bi-weekly	5	£1595	London	LTREE
WINDOWS NT SERVER					
Windows NT4.0 - Technical Overview	14/8/97	1	£330	London	PYGM
Windows NT4.0 Security	15/8/97	1	£330	London	PYGM
Windows NT4.0 - Technical Overview	8/9/97	1	£330	Manchester	PYGM
	27/10/97	1	£330	London	PYGM
	10/11/97	1	£330	Manchester	PYGM
	10/11/97	1	£330	Manchester	PYGM
	11/12/97	1	£330	London	PYGM
Fast Track Windows NT for Developers	To Suit	2	£625	London	QA TR
	To Suit	2	£625	Cirencester	QA TR
Windows NT4.0 Upgrade	1/9/97	2	£695	London	PYGM
	4/9/97	2	£695	Manchester	PYGM
	6/10/97	2	£695	London	PYGM
	16/10/97	2	£695	Manchester	PYGM
	10/11/97	2	£695	London	PYGM
	27/11/97	2	£695	Manchester	PYGM
	8/12/97	2	£695	London	PYGM
	18/12/97	2	£695	Manchester	PYGM
Administering Windows NT4.0 - final	1/9/97	3	£995	Manchester	PYGM
	3/9/97	3	£995	London	PYGM
	8/10/97	3	£995	London	PYGM
	13/10/97	3	£995	Manchester	PYGM
	29/10/97	3	£995	London	PYGM
	12/11/97	3	£995	London	PYGM
	24/11/97	3	£995	Manchester	PYGM
	10/12/97	3	£995	London	PYGM
	15/12/97	3	£995	Manchester	PYGM
Supporting SNA Server 3.0	18/8/97	3	£1295	London	PYGM
	13/10/97	4	£1295	London	PYGM
	15/12/97	4	£1295	London	PYGM
Supporting Win NT Server 4.0 - Enterprise	18/8/97	5	£1360	London	PYGM
	15/9/97	5	£1360	London	PYGM
	29/9/97	5	£1360	London	PYGM
	20/10/97	5	£1360	London	PYGM
	27/10/97	5	£1360	Manchester	PYGM
	10/11/97	5	£1360	London	PYGM
	1/12/97	5	£1360	London	PYGM
	8/12/97	5	£1360	Manchester	PYGM
Supporting Win NT4.0 - Core Technologies	8/9/97	5	£1360	Manchester	PYGM
	8/9/97	5	£1360	London	PYGM
	13/10/97	5	£1360	London	PYGM
	20/10/97	5	£1360	Manchester	PYGM
	3/11/97	5	£1360	London	PYGM
	24/11/97	5	£1360	London	PYGM
	1/12/97	5	£1360	Manchester	PYGM
UNIX and Win NT Integration	Monthly	4	£1375	London	LTREE
Inter-Networking with TCP/IP using Windows NT4.0	26/8/97	4	£1450	London	PYGM
	29/9/97	5	£1450	London	PYGM
	29/9/97	5	£1450	Manchester	PYGM
	3/11/97	5	£1450	London	PYGM
	1/12/97	5	£1450	Manchester	PYGM
	8/12/97	5	£1450	London	PYGM
Developing Windows NT Server Applications	To Suit	5	£1495	London	QA TR
	To Suit	5	£1495	Cirencester	QA TR
Accelerated Training for TCP/IP & NT Server 4.0	8/9/97	5	£1500	London	PYGM
	10/11/97	5	£1500	London	PYGM
Win NT 4 Workstation & Server: Hands-on	Bi-weekly	5	£1595	London	LTREE
	Monthly	5	£1595	Edinburgh	LTREE
Windows NT Optimisation & Troubleshooting	Monthly	5	£1595	London	LTREE
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COMC	Computacenter Ltd
DPR	Database Programmers Retreat
LTREE	Learning Tree International
N-ARY	N-ARY Limited
PYGM	Pygmalion
QA-TR	QA Training Ltd

Computacenter Ltd

ENQUIRY NO. S1

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Email: training@ccenter.co.uk
Web site: http://www.computacenter.com

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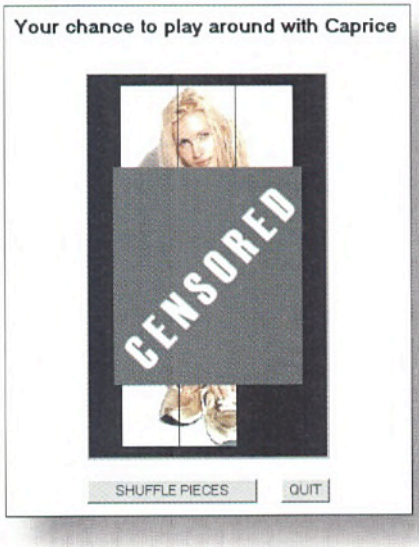
A major hacking

Summer is the season of hacker conventions. It started in July, in London, with Access All Areas (AAA), followed by Defcon in Las Vegas. The second weekend of August, there was Hacking in Progress (HIP) in the Netherlands and at the same time Beyond HOPE (Hackers On Planet Earth) in New York. Many of EXE's past and present staff have been actively involved on the hacker scene, prompting Ctrl-Break to take a keen interest. Ex-editor Robert Schifreen, famous for his involvement in the Great Prince Philip Prestel Hack, was a speaker at the previous AAA, ex-news editor Dan O'Brien followed HIP *(http://www.spesh.com/hip97/)* while David Mery attended Beyond HOPE.

Ctrl-Break always wondered where hacking came from. The answer arrived in the form of a label from a Major Hacking's cookie (Ed – sorry I ate the cookie at the con). Here's the real story... Mr Hacking is from Liverpool (Ctrl-Break would appreciate if any reader from Liverpool could check that it is a relatively common name up there); after having fought Rommel in North Africa, and alongside Lord Mountbatten in India (receiving the promotion to Major in the process), he crossed the bit of water to eventually open a hand-made cookie shop on Long Island. With such a name he was an honoured guest at Beyond HOPE, the first hackers convention he ever attended. So there you are, hacking is British born! Another important fact brought to you by Ctrl-Break. ■

At last – the gutter Web



The Internet has regularly been compared to the more traditional print media, rather than the televisual media to which it seems to aspire. Daily newspapers, weekly and monthly magazines, all have a presence on the Web. Why, even EXE has its own site (which you have visited lately, haven't you?). The good thing about Internet publishing is that, on the whole, the most professional sites have the highest quality of content. But not any more. We were amused to receive, in the space of a week, press releases announcing the online Daily Star – chief attractions including the VRML boozer and niteclub, and of course pictures of Jo Guest with her wrapping paper off – and a rather odd site called Shoeworld.

As the name suggests, Shoeworld is dedicated to clothing for the feet; but to raise the profile of the site, its creators decided to feature an interview with supermodel Caprice Bourret replete with pictures of the young lady (allegedly) starkers – except for shoes. Not content with plumbing these depths of tackiness, the site also boasts a JavaScript 'puzzle board' application where visitors 'must play around with Caprice's bits'. JavaScript 1.1 compliance is required for this feat, naturally.

We were going to publish the URLs of this desirable duo of sites, but in the interests of taste and decency... oh, sod it, the MegaStar is at *http://www.dailystar.co.uk* and Shoeworld's Caprice un-coverage starts at *http://www.shoeworld.co.uk/schuh/frames1.html*.

Just don't blame us when you go blind. ■

Five by Ten

Ms Stob has assembled five vital checklists concerning email and the Net, for you to cut out and keep. Lucky you.

Ten New Email Acronyms

1. AABLAAUJA – About As Likely As A Useful Java Applet.
   Example usage: `He came straight out with it: 'your cheque is in the post'. AABLAAUJA!`
2. ARBIEA – A Rotten Bill In Every Apple
   Example usage: `I used to think that Sun was an independent company, but these days you have to remember there's ARBIEA.`
3. BWRCTPAM – Back When RAM Cost Ten Pounds A Meg
   Example usage: `Haven't seen a hairdo like that since BWRCTPAM.`
4. IMFTBHO – In My Friend Tony Blair's Humble Opinion
   Example usage: `You might think it's unfair but IMFTBHO it's a very generous deal.`
5. ITMA – Information Technology Management Association
   Example usage: `Good morning. I am your ITMA representative. Can I do you now, sir?`
6. IWSOCFW – I Was Switching Off Channel Five When
   Example usage: `IWSOCFW something rather good caught my eye. It was my reflection in the tube.`
7. OBTACC – Overtaken By The ANSI C++ Committee
   Example usage: `It has to be said this old 486 is not fast. In fact it's so slow it's completely OBTACC.`
8. ROFL – Rictus Of Fake Laughter
   Example usage: `> They should be called Tarty Spice, Stupid Spice, Old Spice, Outer Spice and Spice O'Life ;-) ROFL!`
9. TLMBBO – The Last Memphis Beta But One
   Example usage: `Nah - not since TLMBBO! Who wants Java support anyway?`
10. WMFTBS – What My Friend Tony Blair Says
    Example usage: `The DOS version is good enough? *You* might think that, but that's not WMFTBS.`

Ten Email Message Subjects Calculated To Make The Heart Sink

1. `Thank you for visiting the Inland Revenue website`
2. `Re: Your`
3. `Ever thought about retraining as a programmer?`
4. `Important! Your virus checker software has nearly expired`
5. `HotWired Says Hello Again`
6. `Fwd: Fwd: Re: FW Re: Fwd - Reply - Reply`
7. `THIS IS NOT A SPAM`
8. `== No Subject ==`
9. `Get out your PowerPoint!`
10. `New light bulb jokes (8) ...`

Ten Great New Emoticons

Notice how all the following emoticons are achieved with three or fewer punctuation characters. After seeing these, you will never want to use a dull old 'smiley' again. VS.

1. Improved 'happy smile', with contact lenses
2. Swarm of bees
3. Chelmsford bypass, eastern approach
4. Robin Cook's 'Come hither' smouldering glance
5. Shetland pony, limping on front left
6. 'You did say that pump was guaranteed' mused the builder
7. nude vicar (male)
8. Quake troll monster
9. nude vicar (female)
10. Careful Dodi it's stuck she breathed

(Editor's note. In the above section we appear to have been struck once more by our typesetters' famous intermittent inability to set certain punctuation characters. We apologise for this problem, and hope that it has not in any way spoiled your enjoyment of Ms Stob's ingenious and amusing emoticons.)

Ten pieces of advice one might give to an annoying Net neophyte

1. Be sure to create your own website. Not only is it a fun way to while away the evenings, but everybody on the Internet will come and look at it and you will be famous.
2. No, of course there's no stigma attached to CompuServe or AOL accounts.
3. Be sure to cross-post to all the newsgroups that might be relevant – it's the only way to make yourself heard.
4. Those new models are really great – they always connect at 56 K.
5. It's always a good idea to download the latest betas of the big browser packages.
6. And be sure, when you create your own website, to include a photograph of yourself.
7. Use 'Net phone' systems to cut down on your telephone bills.
8. If you find these graphical tools too hard to understand, switch to simpler text-based ones. Like sendmail.
9. And you'll find Linux makes a splendid cheap and cheerful OS on which to use them.
10. Always download the contents of all the Usenet newsgroups. Otherwise you may miss something important.

Ten Net Sayings and Proverbs

1. One GIF, Two GIFs, Three GIFs, Four –
   B*ggered if I'm sitting here waiting any more.
2. A wise man runs a quiet modem during working hours
3. URLs' Court (a trendy nickname for the World Wide Web).
4. Half of Usenet is pouring scorn, the other half is doing the opposite.
5. Sounding the last Trumpet. (Of someone who persists in using Windows 3.1, and is therefore obliged to continue to use a shareware TCP/IP stack.)
6. Cache in hand pays for many a slow link.
7. If you can't use words, use MIME
8. No ping to Redmond means 'slow Transatlantic'.
   No ping to Tucows: tech support frantic.
   No ping to Docklands: major Internet brownout
   No ping to ISP: InterNic's pulled the plug out.
9. As useful as two-month-old milk, but not as tasty. (To describe a 9 MB file which is the remnant of an attempt to ftp a 10 MB .EXE over an unreliable slow link.)
10. A rotten Bill in every Apple *(Hey! You've had that already! Be off with you – Ed)*

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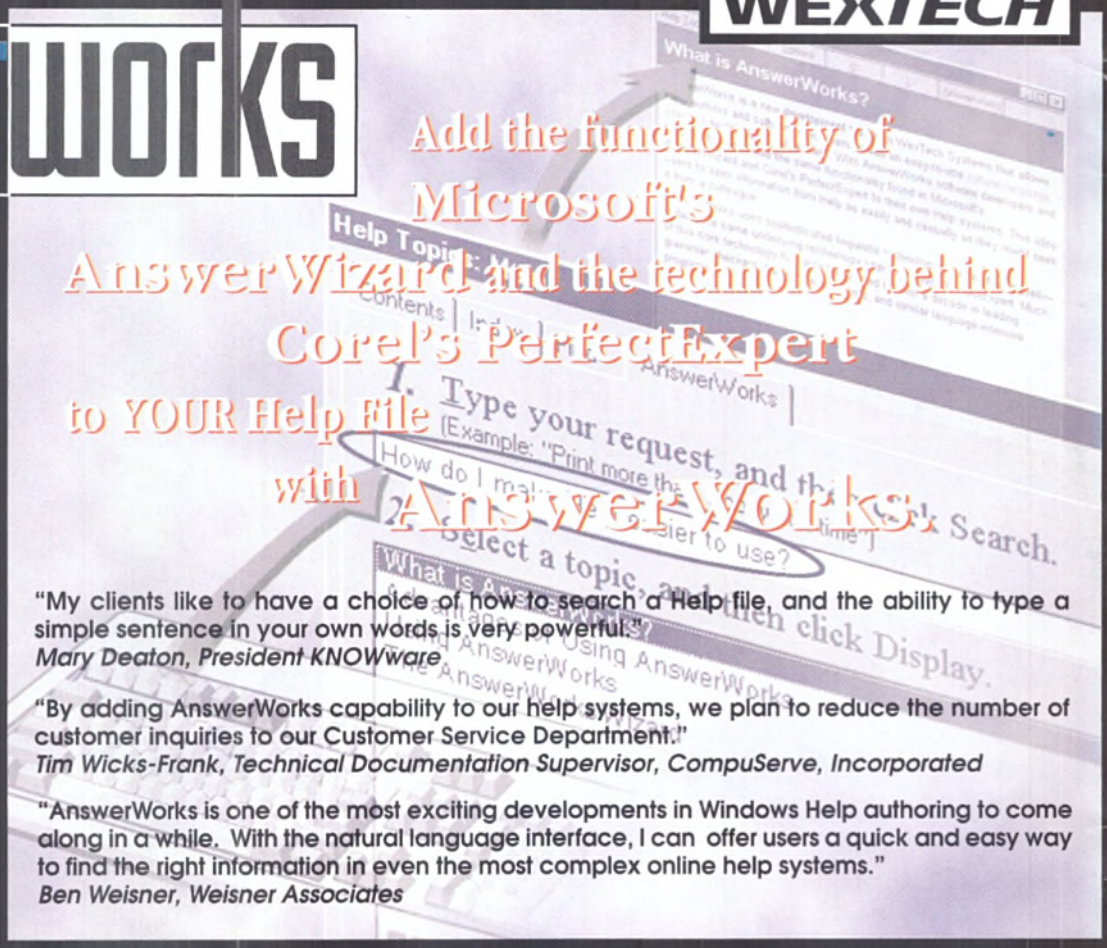

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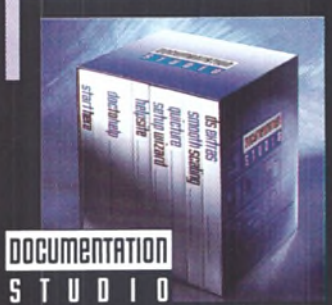

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