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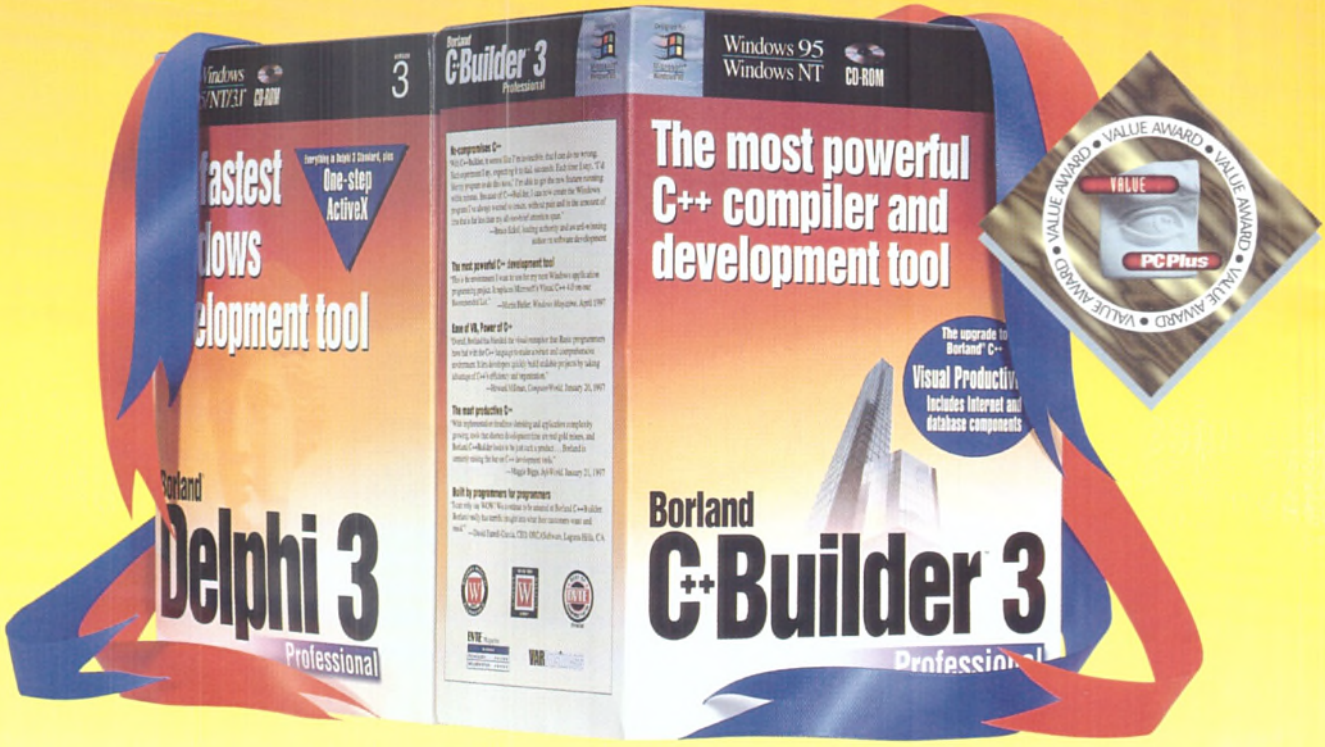

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THE FRONT END

SoapFlakes 5
The advantage of using CBD.

News 7
Wise Installation 7, NetTracker 3.5, and the Pervasive show is on the road again. LiveQuality testing from Segue Software, PVCS Tracker 6, and InstallShield Professional 5.5.

Mayhem 14
'Take us to your leader! We come bearing gifts,' said the little green aliens. 'Don't want 'em,' says Jules, 'Go home'.

Letters 16
Happy developers. A means to an end. A better C. What's new. And a salute from an old programmer.

LGM not welcome 14

THE CODE

Windows Shell32 secrets 18
Shutdowns, restarts, file browsing, and picking icons... Dave Jewell sniffs out the undocumented dialog-based functionality to be found within the Windows Shell32.dll library.

The SQL tool in your Java toolkit 27
Chris Drawater takes a close look at SQLJ, an alternative to JDBC for database access through Java.

Don't you just love being in control 35
Ian Murphy reviews the Software Configuration Management offerings from Rational Software, StarBase, Intersolv, and MKS.

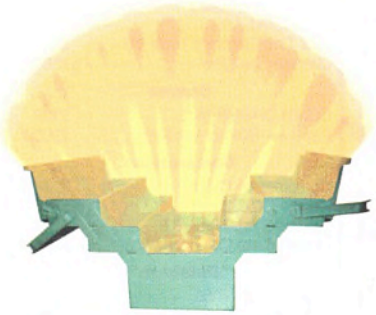
Developers take control 35

The art of errors 47
Peter Collinson asks a simple question: when we write programs why do we check return values from routines for errors?

C & C++ 53
Francis Glassborow warns that the current C++ definition of default-initialisation requires programmers to be aware of implementation details in other people's code.

Delphi 57
Mark Smith looks at two design patterns – Visitor and Singleton – that lend themselves to be represented as interfaces.

Java 61
Tom Guinther shows how Tcl can be integrated as an application's macro language, providing an extensible model for the creative end-user.



The revelation of SQLJ 27

Visual Basic 65
Jon Perkins considers the problems with the LostFocus event that led Microsoft to introduce the Validate event, and he reviews the Graphics Server from Bits Per Second.

THE BACK END

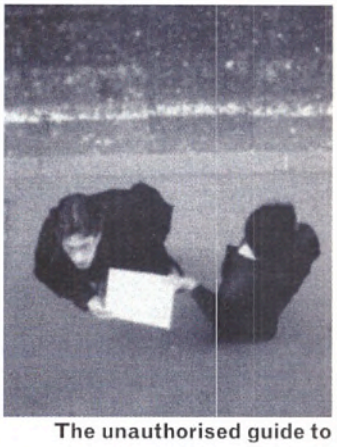
Ctrl-Break 77
Ctrl-Break encounters some monkey business. Plus Verity Stob answers your burning Linux questions.

SERVICES

Directory 63

Software training guide 67

Recruitment 71



The unauthorised guide to Shell32.dll 18

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Do You Need to Create Complex Installation Programs?

InstallShield 5.5 Professional puts all of the power needed to develop installations for the most demanding applications right at your fingertips. The IDE lets you author, organise, build, and test your setup project from one central location and InstallScript is the world's most powerful installation language, so you can handle projects of any size and scope. New features include an enhanced VB Project Wizard that creates a complete VB 5/6 installation in four easy steps, new templates, dynamic file linking, application repackager, etc.

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Wise Install 7.0

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The advantage of using CBD

For people in IT, identifying genuine developments from the constant cacophony of industry-generated hype is a never-ending task. Over the last decade we've had relational databases, Case tools, the Internet, object-orientation, client server, and who knows how many other buzzwords to digest, weigh up, and place bets on. For many developers and IT managers Component Based Development (CBD) must seem like just one more buzzword generated by a coven of consultants to drum up more business. But then of course there's always the possibility that it represents a change so fundamental that failure to adopt it now could spell disaster!

The reality is neither as benign nor as threatening as these possibilities, because for once there are real benefits to be gained and few drawbacks hidden behind all of the hype. Of course, there will be those who jump on the bandwagon, generate a mountain of new jargon, and make false claims, but behind all the smoke and mirrors there are some persuasive reasons for taking a long hard look at CBD.

History shows that we tend towards becoming increasingly sophisticated consumers in both the real world and in software. This causes an increase in the breadth of functionality and in depth of complexity. In the physical world, this has lead to a growing reliance upon specialists to perform tasks that we cannot manage due to time or skill constraints. This has lead in turn to the development of sophisticated supply chains in which end-user products are composed of components that themselves have several layers of component dependencies.

A good example is the personal computer, a single end-user consumable that is composed of a number of major components such as the processor, disks, video card, and keyboard. Any of these may have been created by the manufacturer or sourced elsewhere. Some of these components will have their own dependencies. For example, the motherboard will be composed of numerous discrete electronic components.

The evolution of the same situation in the virtual world is less advanced, as solution providers typically attempt to create whole systems end to end, or perform rudimentary integration of several complete systems via data import or API interfaces. Software components offer a compelling solution to this problem by allowing delegation of complexity to specialist third parties while maintaining tight integration with proprietary functionality. The result is a unified system that can provide a consistent user interface while still satisfying the breadth of functionality required. Furthermore, by delegating to third parties we can expect a far higher level of quality due to the increased focus and knowledge that they bring to the party. Surely a company specialising in email address validation components will create a far more competent product than one written as part of a larger system, after all that company's livelihood depends upon it.

Of course, there will be those who jump on the bandwagon, generate a mountain of new jargon, and make false claims, but behind all the smoke and mirrors there are some persuasive reasons for taking a long hard look at CBD.

Take as another example a UK hardware company creating a system to sell its products via the Internet. While that company would be rightly focused on the business of packaging the products ready to sell on the Web and creating an appropriate user interface, it would also be forced to deal with European tax issues presented by the global nature of its new potential customer base. Rather than invest hours into understanding, designing, and coding VAT validation functions, it will be more efficient, cost-effective, and less risky to buy a specialist component that encapsulates the business rules to perform the task. The component need not have a visual interface but should simply provide business logic that can be treated as a black box.

Additional benefits of this approach include the improved consistency achieved by having a single source of VAT rules (how does changing a single server-based component rather than updating a thousand desktops sound?). And there is a lower maintenance overhead as the component provider will be responsible for updating the component to accommodate any changes to VAT rules in the future. All of which leaves the hardware provider focused to do a better job of its core speciality.

As we begin to move away from the millennium bug, it is likely that much of the coming development effort will be directed towards maximising the benefits of transacting over the Internet and focusing on other emerging technologies. Competition for new contracts will be intense and development time will be of the essence. Deploying CBD as the foundation of your system strategy may be the key to gaining the necessary competitive advantage to win. ■

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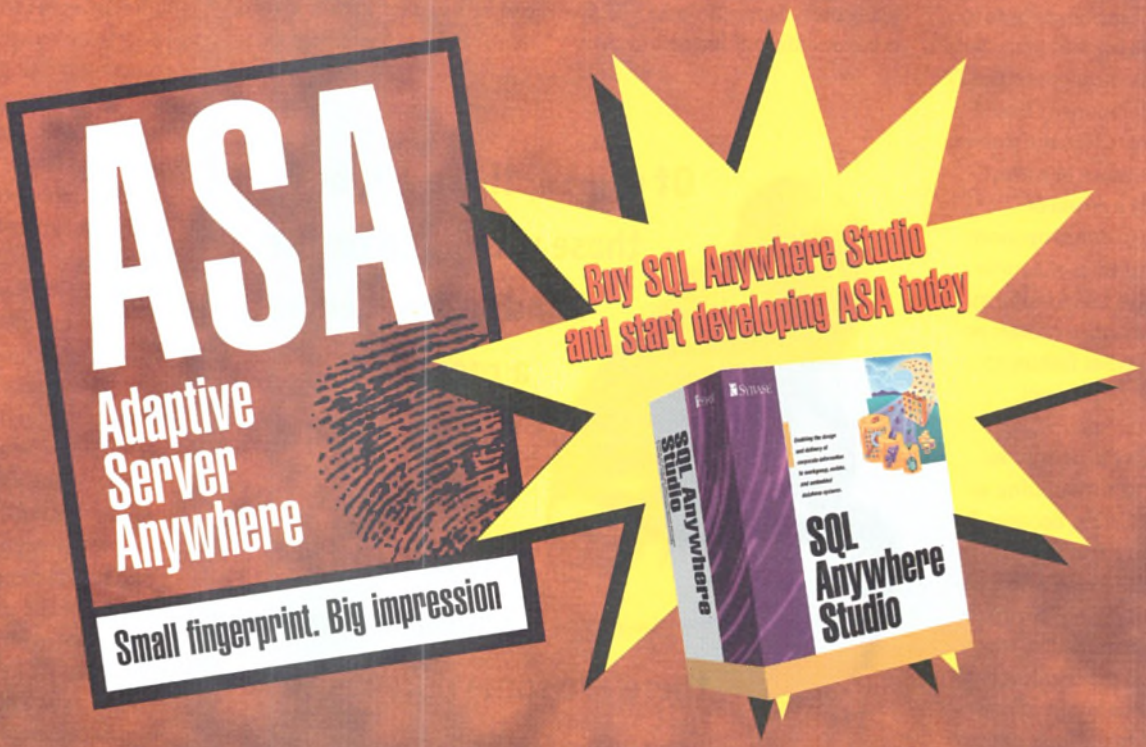

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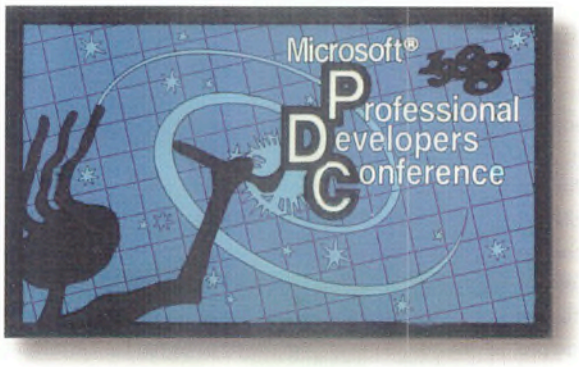
Micrososft's PDC of paradox

Microsoft's Professional Developers Conference, in Denver, was attended by about 6,000 – according to the organisers. It filled Denver's Conference Centre and a little bit more. The conference was opened by a paradoxical keynote speech by Bill Gates. He announced that Windows NT5 – the main theme of the conference – would ship with more applications than any other version of Windows ever had. Now what is the PDC if not a conference for Windows developers? One would expect the attendees to be the ones writing the future apps for NT5, but if some absent competition has already developed products for most markets on NT5 what's the point? I guess that Bill Gates' presentation was just slightly too general for this particular event.



Another paradox is Bill Gates emphasis on simplicity: 'if there's one thing that we really need to prioritise, and this became our top initiative just about a year and half ago, it is simplicity'. And, to make it really clear (and simple) 'now we've given simplicity the same position [as we gave to the Internet]'. Surely, the present complexity of Microsoft's software was never designed as a feature. One would hope that simplicity of use has always been a goal of Microsoft and of the rest of the software industry.

The main tracks of the conference reflected the new features of NT5, ie the active directory, the installer capabilities, and intellimirror. The active directory is where you'll have to store your application information – no more `.ini` files spread all over the filesystem. The installer features support 'self-healing', which is that the system can detect that some files are missing and automatically retrieve them from the server; this should make applications more resilient. Intellimirror mirrors check back and forth between clients and servers so that you can benefit from a central administration and at the same time fast local execution. But for all this to work Bill Gates emphasised that 'everything here requires you as developers to take advantage of these features'. One drawback so far of taking full advantage of all Windows technologies has been complexity. According to Bill Gates, this is all over: 'So that's queuing, directory, security, all of those things done in a holistic way, so you don't see a different programming model for them individually. You don't see a different performance model. You don't see a different security model.'

RIP NT

Windows NT 5.0 is officially dead. Despite the current wide beta programme, NT5 will never see the light of day. But before you panic, it's just another case of the famous Microsoft name-change. From Beta 3 onwards, NT 5.0 will be known as Windows 2000.

A recent announcement outlined the new product range: the workstation version will be Windows 2000 Professional, the server version Windows 2000 Server, the enterprise server version Windows 2000 Advanced Server (shades of the original NT Advanced Server 3.1), and an additional version, Windows 2000 Datacenter Server, will cater for large-scale data warehousing and number-crunching applications, with SMP support for up to 16 processors. Microsoft is also promising support for up to 64 GB address space with Win2000 Datacenter Server, which implies a 64-bit architecture.

This leaves an obvious hole for a consumer version, which may be the long-threatened unification of the NT and Win9x product lines. Nothing has been announced yet.

A further wrinkle to this story emerged last week when someone else claimed to own the rights to the Windows 2000 name. Robert Keirstein has been using the name as part of his Encyberpedia online encyclopaedia project. However, Microsoft believes that it has clear rights to all permutations of the Windows name and doesn't anticipate any difficulties.

w www.microsoft.com w www.windows2000.com

Rainier

Visual Studio 6.0 has just shipped, but already there is talk of the next version. V6.0 used to be codenamed Aspen, it introduced support for DHTML, IIS, ADO, and OLE-DB. Rainier, which should ship in about a year, will add support for NT5, SQL7, and COM+. According to Paul Gross, Vice-President Developer Tools, the 'Visual Studio vision' is to simplify the implementation of DNA applications, take advantage of NT5's scalability, improve the time to market with COM+, and extend interoperability to the web protocols.

Developing COM+ applications will be much easier, and the same goes for accessing the Active Directory with the help of OLE-DB. Rainier will also support the new installer capabilities and will let you build COM+ objects with attributes; it will completely take care of IDL for you.

Money.h++ 2.0 is an expanded version of **RogueWave**'s C++ and Java class library for monetary representations, currency conversions, and decimal precision. It is designed to support euro transitional conversion algorithms.
www.roguewave.com

All **CodeWarrior** development tools will support the **Embedded** C++ draft specification. Metrowerk's **EC++** Library is a fully compliant, optimised implementation of the Draft Standard. With a small footprint, it is distributed in source code form to facilitate debugging. Metrowerks has also begun shipping its CodeWarrior Analysis Tools Suite (CATS). It includes a graphical hierarchical profiter and graphical code coverage tool.
www.metrowerks.com

Aonix's **Validator/Req** 1.1, a specification-based **test** generation tool, now integrates with Mercury Interactive's **TestDirector**, which manages the testing process. These tools combined enable users to model requirements as well as generate, execute, and evaluate test cases.
www.aonix.co.uk

Though not part of the major PDC announcements, it was clear that **Microsoft** is focusing strongly on all things embedded. At the low end, **Windows CE** is targeted at all kinds of appliances including games machines (an agreement's been signed with **Sega**). For larger devices such as PBX switches, copiers, and medical equipment, Microsoft is working on an **embedded** version of NT4 (currently with the help of VenturCom). Another embedded market that is attracting Microsoft's attention is the home.
www.microsoft.com/embedded

Changes for change requests

Version 7.0 of **WinZip** includes support for Microsoft's **CAB** format, and a configurable toolbar with up to 21 functions. There is an option for an **IE** 4.0-style 'one click open' interface, an improved print facility, and support for Zip comments.
www.uit.co.uk

Intersolv has released DataDirect Connect **OLE DB** 2.0 and DataDirect SequeLink OLE DB Edition 2.0. Employing the data access method featured in Visual Studio 6.0, they include a range of components for **relational** and non-relational database access.
www.intersolv.com

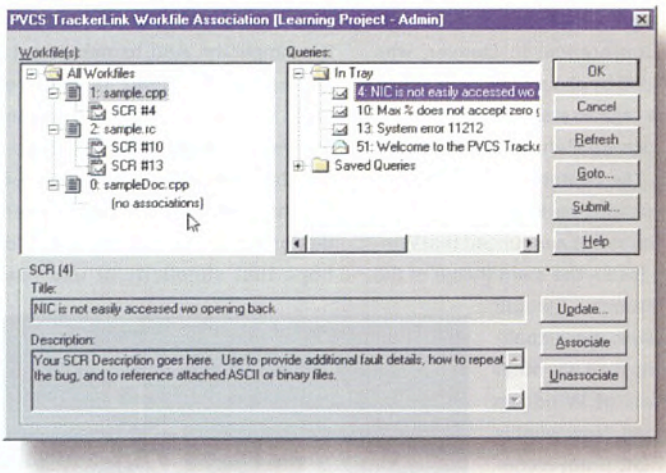
ColdFusion support for Linux is promised by **Allaire**. It intends to support the base version of **Linux** and other popular commercial versions of the OS in a future release of its web application server.
www.allaire.com

The Client/Server editions of **JBuilder** 2.01 come with version 3.3 of **VisiBroker** and include the Naming and Event services. UI enhancements include access to VisiBroker **IDL2JAVA** command line arguments. The UI designer has a new property editor for Image and Icon properties.
www.inprise.com

ILOG JViews 2.0 is an enhanced version of ILOG's 100% pure Java **graphics** library. This release includes web-based mapping, relationship displays, and easy-to-design, data-aware icons. It runs on any **Java** platform and any browser that supports JDK 1.1 or later. Prices start at $6,500 for a single developer licence.
www.ilog.com

To automate the process of tracking project issues and related code changes, PVCS Tracker 6, with TrackerLink, integrates with IDEs including Microsoft Visual Studio, Sybase PowerBuilder, and Micro Focus Net Express. The software configuration management system is the foundation of an Intersolv team development infrastructure linking management issues (prioritising and optimising team effort) to development environments, version control, and automated testing. For example, TrackerLink integrates with PVCS Version Manager, as well as Microsoft's Visual SourceSafe. Enhanced reporting capabilities and an improved GUI are designed to help teams to capture and manage project issues as they arise.

PVCS Tracker 6 is designed to capture, manage, and communicate a high volume of feature requests, defect reports, and code changes facing a project team.



Features of Version 6 include enhanced reporting capabilities and cross-project visibility of information. Reporting features include 'rate-of-change' and cumulative trends to aid prioritisation of workloads and to generate faster response to end-user needs.

The user interface has been enhanced with a Windows 98 look and feel. Combined with usability enhancements to the Submit and Update forms, this is designed to streamline data entry and issue management.

The price of PVCS Tracker 6 starts at £450 per authorised user.

Intersolv was recently acquired by Micro Focus, a provider of enterprise application development and maintenance systems for MVS, Unix, Windows NT, and web environments.
w www.intersolv.com

It's Sun 1, MS 0 as AOL snaps up NS

As we went to press, we learned that the judge in the Microsoft vs Sun case has granted a preliminary injunction forbidding Microsoft from distributing any product incorporating Java technology incompatible with Sun's. Microsoft has 90 days to comply. The ruling affects every product containing Microsoft's JVM, including Windows 98, Internet Explorer, and its Visual J++ product. In practice, this will mean adding support for Java Native Interface (JNI).

On the Visual J++ front, Microsoft will have to change the product so that it defaults to using JNI rather than the Windows-only WFC, and make it possible to produce 100% pure Java code. J++ will also have to warn users who enable WFC support that this will render their applications incompatible. Given that J++ currently has no support for visually building AWT forms, this may mean a significant amount of re-engineering for a product which only shipped in completed form last month. Existing users of Microsoft software will not be forced to upgrade, but the company will provide patches for all its Java-enabled products.

Meanwhile in an unexpected move, AOL is to buy Netscape, which almost certainly signals the end of its relationship with Microsoft and Internet Explorer. While few details were available at time of going to press, it emerged that part of the deal is a new strategic relationship with Sun to distribute Netscape's server products and browser technology. Developer reaction was muted, with many happy that Netscape's future is assured, but unhappy that it is AOL - with its dismal reputation among the technically literate - that is the saviour.

w http://www.microsoft.com *w http://www.sun.com*
w http://www.netscape.com *w http://www.aol.com*

Wild cards for installation

InstallShield Professional 5.5 features enhancements to simplify installation development for large-scale projects. These include Dynamic File Linking, an Application Repackager, quick creation of installations for Internet distribution, an enhanced VB Project Wizard, and new templates to simplify the creation of installations for common Windows technologies, including ODBC 3.5, BDE 5.0, PowerBuilder 6.0, and Access 97.

Dynamic File Linking allows installers to add files to their projects at build-time using wild card characters, registry entries, and environment variables. The idea is to allow the building of applications developed by large workgroups without knowledge of the specific files needed.

InstallShield Professional 5.5 is available from a RRP of $795. It can be ordered from the Web.
w www.installshield.com

are you LOGICAL or lateral?

Developers tend to be portrayed simply as creatures of logic. Pure left-brainers. A little unfair when you consider that the best solutions are produced by a combination of logic and lateral thinking. **Microsoft® Visual Studio™ 6.0** works the way you work seamlessly integrating the logical with the creative.

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Enquiry No. De4

- Includes latest 6.0 versions of Visual Basic®, Visual C++®, Visual J++™*, Visual InterDev™ and Visual FoxPro®.

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*Technology Preview 2 will slip in the box with a free upgrade voucher for the final version of J++6.0, (available October 1998).

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VisualCafé™ Version 3

Enquiry No. De5

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SYMANTEC.

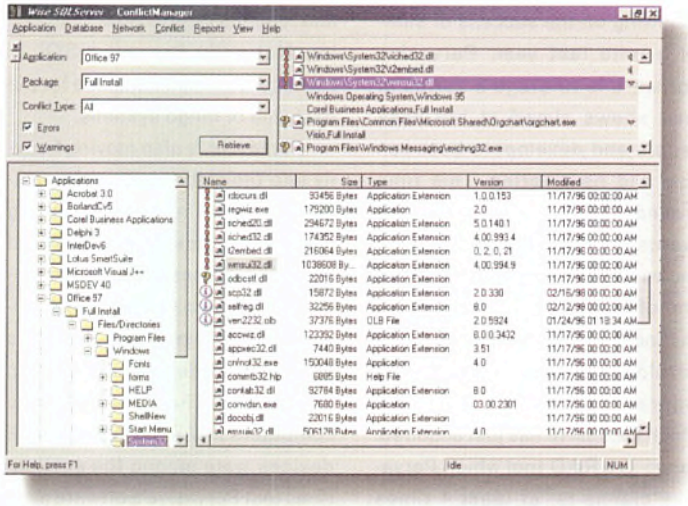
The best selling Java IDE for 3 years running.

Wise web deployment

Four new installation suites have been created by Wise Solutions: InstallMaker, InstallBuilder, InstallMaster, and InstallManager. All these releases include Wise Installation 7 and they are designed to make installation and web deployment easier, and with InstallManager there is a ConflictManager (pictured) designed to eliminate DLL file conflicts.

InstallMaker allows developers to build customisable installation programs in a 6-step process. By including Wise Installation System 7.0 it encompasses Installation Expert, Visual Basic Import Wizard, Application Watch Wizard, and multi-language support. SmartPatch is for creating installations that contain only the difference between two or more versions of an application.

InstallBuilder is described as a more sophisticated installation suite which features an integrated debugger, functionality to call any Windows API from an installation script, a script editor, custom dialog editing, and custom graphics editing. Again, the Wise 7 and SmartPatch products are included.



InstallMaster is the next step up, with further control over installations. In addition to InstallBuilder, it includes SetupCapture for repackaging other installations into Wise scripts, and WebDeploy for scanning a destination PC to download only the files required.

Finally, InstallManager allows system administrators, or whoever distributes software applications to Windows users, to identify file and registry conflicts before they occur and streamline the entire process of installing Windows applications. The new ConflictManager is a database application that screens files, icons, and registry keys across several applications to identify potential file conflicts. Wise 7, SmartPatch, SetupCapture, and WebDeploy are also included.

InstallMaker is priced at £110, InstallBuilder at £225, InstallMaster at £445, and InstallManager at £995. These releases are available from the ComponentSource website.

w www.componentsource.com

Watching you surf

Tracking the usage of your website is provided by NetTracker 3.5, from Guildsoft. Coming in Standard, Professional, and Enterprise editions, the program is designed to provide individual and corporate users with website traffic analysis. The web browser interface allows access to NetTracker reports via the Internet or an intranet. And this version provides new reports, generated with the use of minimal disk space. GZipped log files can be directly imported.

All versions of NetTracker 3.5 are equipped with a built-in web server. This is to allow users to analyse their website traffic data on a client computer (Windows 95/NT), as well as on a web server (Windows 95/NT and Unix). Enhanced filtering capabilities and support for W3C, Lotus Domino, and Open Market Extended log formats are also built into each version. Professional and Enterprise versions come with standardised Internet and intranet configurations, containing up to 21 reports.

NetTracker 3.5 is available for Unix and Windows 95/NT web server platforms. Supported web servers include Netscape FastTrack/Enterprise, Apache, Microsoft IIS, and Lotus Domino.

Available from Guildsoft, the Standard edition costs £195, the Professional edition £395, and the Enterprise edition (with a licence for five websites) £795. Fully functional demonstration copies of each of the three versions of NetTracker 3.5 are available online at *http://www.sane.com/demo*.

w www.guildsoft.co.uk

Mature Java

Java is maturing with the main compiler vendors announcing new versions of their products. IBM has just launched Visual Age for Java 2.0. It supports JDK 1.1.6 and Swing 1.02. In addition to Windows, v2.0 runs on AIX 4.2 and 4.3.

In the meantime, Symantec should have started distributing Visual Café 3.0. Any VM can be plugged-in, including JDK1.2. It is accompanied by about 200 JavaBeans with source code, they're JFC/Swing-based and support Introspection. The compiler is supposedly 40 times faster than Sun's javac. The development environment is fully two-way. The Professional Edition is planned for mid-November, followed by the Database and the Standard Editions coming out in December.

w www.symantec.com/domain/cafe

w www.ibm.com/java

The IBM **TXSeries** ADK adds support for **COM** Programming to help the development of enterprise-class applications for Windows-based clients. The transaction-processing components also interoperate with Enterprise Java Beans and **Corba**.

www.software.ibm.com/ts/txseries

Exceed Web, from Hummingbird Communications, is a centrally-managed, Java-based **Thin X** solution that allows corporations to use a familiar browser interface to provide users with access to **X Windows** applications.

www.hummingbird.com

Wind River Systems has released version 2.0 of its **Tornado** integrated development environment. It includes an enhanced source-level **debugger** and a quick installation procedure for reduced system administration. External editors can be integrated easily into the system.

www.windriver.com

Computer Associates has announced its **Ingres II Linux** Edition Open Beta program. In the new version of CA's **RDBMS** there are interfaces for C, compatibility with IngPerl, and support for BLOBs.

www.cai.com

InstallShield Software will extend its product line to include an installation toolkit for developers for the **Windows CE** operating system. The new product will provide an easy-to-use **installation** authoring environment for Windows CE versions 1.0 and 2.0.

www.installshield.com

Pervasive on the road again

Following on the success of similar events last year, Pervasive Software is to stage a series of road shows aimed at business people and developers between now and next spring. This time around, there will be separate events for developers. The road shows will be promoting the latest line of tools from Pervasive, including the Tango web application development system and Bolero log-tracking tools from Everyware, which Pervasive has just acquired. Tango is a RAD tool which Pervasive claims is 'at least 4 times faster' than ColdFusion or ASP, and requires little or no actual coding. Naturally, Pervasive.SQL is the recommended database for the back end of Tango systems.

Pervasive is also moving heavily into the embedded market, traditionally not a particularly big user of databases, with a set of mini-DBMSs based on the company's transactional Btrieve technology, but with relational capabilities as well. Mobile phones, set-top boxes, and handheld/palmtop computers including Windows CE devices were among the applications that Pervasive Software aims to support.

Also coming is a new line of workgroup-level versions of Pervasive.SQL for applications which need to support small numbers of users, with appropriately economical licensing options, intended to compete with MS's forthcoming runtime version of SQL Server 7.0.

Pervasive's stated aim is to be a 'data management company' rather than simply a database vendor, and to this end the company will be developing further related products, with the goal of creating a full end-to-end set of tools for every size and shape of platform.

w *www.pervasive.com*

Cool:Biz 4.0 is the latest release of **Sterling**'s enterprise-scale business and application modelling tool. There is support for DB2, Oracle, and Sybase, in addition to the existing support for over 20 other databases.
www.sterling.com

Also from Sterling, **COOL:Jex 4.0** (formerly Cayenne's ObjectTeam 8.1) enables the development of complex object-oriented applications using a combination of team-based modelling support and **code-generation** for a wide range of environments. There is full development lifecycle support, project control features, and a **repository** for software reuse.
www.sterling.com

Giant Technologies' SourceOffSite enables users to access their MS **SourceSafe** database via the Internet. It allows users to remotely book files into and out of the system, create new projects, view histories, or find differences between versions, in real time.
www.giant-technologies.com

PHD Computer Consultants has released **DebugPrint** for beta testing. This product lets you include formatted print trace statements in **WDM** drivers for Windows 98 and NT. The **trace** statements for all drivers under test can be viewed in the DebugPrint Monitor on the same PC.
www.phdcc.com/debugprint

Whole Tomato Software released version 1.2 of **Visual Assist**, an addition to Visual C++ 5.0 and 6.0. By adding full dynamic parsing to the editor it offers features such as **typo** warnings, word suggestion, and Auto Correct Case.
www.wholetomato.com

Keeping ahead of Visual Studio

True DBGrid Pro 6.0, a 32-bit ActiveX control from APEX Software, adds more than 100 data presentation and user interface features to the DBGrid included in Microsoft Visual Studio 6.0. It supports Microsoft's new data access methods including ADO and OLE DB.

New features in True DBGrid Pro 6.0 include: full support for IE 4.0 and other ActiveX-compatible browsers; multi-column sorting and searching with an enhanced `XArray` object; formatted preview and printing of grid contents from ad hoc queries; the ability to merge contiguous like-valued cells of a column into a single cell; attaching bitmaps to headers, footers, and record selectors; asynchronously downloadable layouts for initialising the grid on an HTML page; tree view property pages for easy configuration of the grid; and the option to export to HTML or delimited text files.

ComponentSource distributes True DBGrid Pro 6.0 at £195.

w *www.componentsource.com*

Quality testing – live

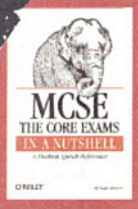
If you've never heard the name Segue, it may come as something of a surprise to you to learn that the company is one of the big names in testing tools across the Pond. Segue describes itself as the 'e-business testing company', and sure enough the majority of its product set is designed to test commerce-enabled websites. The most recent addition to this set is the LiveQuality suite of products, which builds on the existing Silk line. Silk is the actual testing tool, comprising load-testing and automated script-testing functions for HTTP servers, databases, middleware, and clients – usually browsers. LiveQuality introduces the concept of 'scenario testing', and provides a set of tools for creating these scenarios.

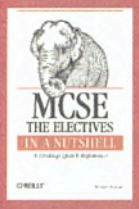
Existing automated test tools rely either on load testing – simulating multiple client connections to a system – or script capture, where the tester (or testers) perform a series of actions on clients and servers to load down the system, and capture all the actions they perform into a test script which can be run again and again as required. LiveQuality takes a different approach, allowing developers or testers to devise real-world scenarios by combining predefined elements which simulate real-world effects, such as a sudden surge in users, a database failure, or an external network problem. Elements can be applied to different parts of the system, such as the web server, the network, the back-end database, or the client link. Segue claims this process makes it easier to identify typical performance problems that will happen in actual deployment. Users can of course define their own elements as appropriate to their business and application, and Segue's services division will assist in the initial setting-up of appropriate scenarios.

LiveQuality is available immediately. Pricing is set individually per customer on application and depends on the precise configuration required. Contact Segue for more details.

w *www.segue.com*

In a Nutshell
from O'Reilly





You've been searching for answers . . .

and staring into the computer screen far too long. The computer is acting up again. Or is it just your weary brain? Your deadline is fast approaching, and you feel under seige. Any solution seems distant and unreachable. In another time the decision would be easy—call in the Royal Guard. You only wish you could.

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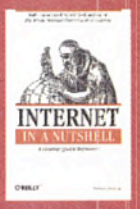

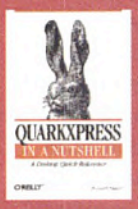

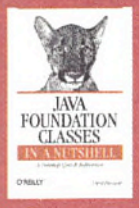

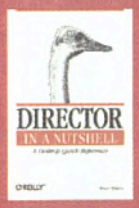

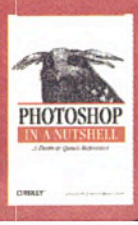

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Enquiry No. De6

Go home, ET

'Take us to your leader! We come bearing gifts,' said the little green aliens. 'Don't want 'em,' says Jules, 'Go home'.

Even if they really believe that they've been abducted by aliens, I can't understand why anyone would go and tell anyone else about it. Everyone knows that anyone who has had the experience is either delusional or lying, and all these people do is expose themselves to ridicule and (if you'll forgive the expression) alienation.

And, yet, they do tell people. All over the world, hundreds of people every year report their experience, and most spend the rest of their lives trying to make sense of an enormously important event in a (suddenly insignificant) world that won't believe a word of it. No wonder they resort to support groups where they find their experience repeated over and over again.

It's interesting that a concept that everyone understands (travellers from another planet) is so easily dismissed as a fiction. It's a scary thought that there might be other races out there. On the other hand, the thought that there isn't even *one* other in all the trillions of stars that make up our own, insignificant galaxy is a lot more scary, mitigated, of course, by its utter implausibility. That's why intelligent, well-respected people are spending good money on trying to find alien races, and on figuring out how to communicate when they find them. (As an aside, exolinguistics is a wonderful study, unimpeded as it is by any self-supporting theory or physical observation. It's an ology for people who do not like rules!)

It does seem reasonable to assume that other races are out there. It also seems reasonable to assume that at least some of them are explorers and tool users. Does the fact that they haven't been to see us mean that the light barrier really is a barrier, and that space warping is impractical? No, it doesn't, because even if that were so, how come no race ever sent out multigenerational vehicles – arcs – to spread itself, plant-like, across space?

The point is that you and I don't know whether they've been or not, and we only have the word of a few people that they haven't. The abductees (who tend to be unsophisticated people who live in remote areas) are not the kind of people to control access to information or artefacts. The people who do control access to information and artefacts are, by their nature, powerful and intelligent people who have a huge investment in their own power and intelligence, and common knowledge of these hypothetical visitations would seriously upset both.

Proof positive of such visitations would also have a profound effect upon society. Remember, they have come to see us, so interstellar travel is possible for them. That means they have access to some rather interesting technology, and a universe full of natural resources. Given that most of what *we* do is motivated by technology or money, can you imagine the effect that such an encounter would have on human society?

Why would anyone build a house, when you can grow your own by taking a cutting? Why would anyone write a database program (or set one up) when it was known that only one, galaxy-wide database connected the minds of all the (civilised) inhabitants and supplied its information on demand. Why would anyone worry about the price of land (and the value of minerals in it, or its nationality) when it became known that anyone could have a planet of their own just by going there – and there's plenty of them to go around. Why would anyone care about money when *everything* was too cheap to meter?

Such an encounter would blow human civilisation back to the Stone Age quicker than any amount of explosive. The only thing we'd be able to do better than our new friends would be certain types of art (maybe), and we'd be reduced to eking out a living (or at least justifying our right to exist, which is pretty much the same thing) by making ethnic artefacts for distribution to a relatively uncaring universe. Humans would be savages for a generation or two, until we began to understand what it is to live in a cosmopolitan universe, and began to emerge to take our place alongside the rest of civilisation.

This is exactly what happened to the civilisations of Central America, then the Indians of North America, the African nations, and the Aboriginals. The European visitors (who arrived in force, as soon as technology allowed) could see nothing more than savages because their very presence (along with the tools that enabled them to stay there) destroyed the basis of the civilisation that existed previously. Contrary to the opinions and preferences of historians drawn from the conquered races (who are now learning how to live in a cosmopolitan planet, and consequently are acquiring a real voice), simply going home again wasn't an option, because they could no more remove the knowledge of their existence and technology than they could remove the smallpox that devastated the Pacific islands.

Human endeavour, which today is largely dependent on technology, works only because the different players are operating at roughly the same level. The routes of communication that are at the heart of science help keep the field level, and science has jealously defended those routes in spite of commercial and political efforts to curtail them. Technology is not so lucky; most technology companies restrict communication in order to achieve market advantages and consequently run themselves (and the stock market) ragged trying to stay in a very competitive game. But if one player gets an overwhelming advantage, everybody (including the winner) will lose any motivation, and development will simply stop – what was the driving force behind endeavour will become valueless. Just like a skilled snooker player in a pub full of amateurs, the game is simply over for everyone.

That's why there is no Area 51, and there was no Rosswell incident. Even if there was, we've all got to believe there wasn't, purely for our own protection. The abductees *are* all lying or delusional, because the alternative is unthinkable. ■

When Jules was a child, he wanted to be an astronaut. Now he's got higher hopes. You can call him on 01707 662698, or email mayhem@jules.cix.co.uk.

A better C

Dear Sir,
If Neil Hewitt is looking for a 'better' Object Oriented C, perhaps he should check out Objective-C which has been used by Apple/NeXT for the last 10 years and supported by the GNU C Compiler for a nearly as long.

For those that do not know, Objective-C adds a small amount of syntax to standard ANSI C to support object-oriented programming techniques. It is a powerful language that is easy to learn and use. Java got a lot of its better ideas from Objective-C. The much admired never bettered NeXTStep development environment was largely based around this language.

For more information have a look at: *http://developer.apple.com/techpubs/rhapsody/ObjectiveC/index.html.*
Aled Davies,
Systems Programmer,
Group 5 Developments,
aled.davies@bigfoot.com

A means to an end

Dear Sir,
I find your magazine, like other magazines, fairly interesting and a way of keeping abreast of the technology. But that *is* part of the problem. I see development tools as a means to an end. And, for me, the 'end' is the project being developed.

There are many facets to project development – planning, design, implementation. These are the broad categories which govern project development. All these phases require methodologies, architectures, and techniques, the very stuff which is *not* discussed in your magazine.

I would like to learn about the Client/Server architecture and how the tools you describe in your magazine achieve the goals described by that architecture. I would also like to learn methodologies such as SSADM and their relative merits. I am sure there are tools which deal with aspects of project development for you to concentrate on in your magazine.

As well as describing the functionality of the development tools, you should be describing 'techniques' that can be used to solve business problems and how these interrelate. I know it sounds like Business Analysis, but if you separate Analysis and Design from the development tools, you will lose something valuable that can't be described in words. In fact, you will increase the value of those development tools.

Besides, if management can see the true benefits of such development tools, they would buy them more readily. Furthermore, you will be doing the business community and the economy a great favour.
Kasim Muflahi,
Principal Computer Officer,
Sandwell MBC,
Oldbury, B69
We hope you'll find this month's article *Don't you just love being in control?* on p. 35 approaches this area: Ian Murphy reviews a range of software configuration management systems.

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

Happy developers

Dear Sir,
I read David Mery's SoapFlake (October) with considerable sympathy.

I started in software development more than thirty years ago (with ICT, a forerunner of ICL – anybody remember them?). A few years, a few promotions and I was a development manager and never got involved with any real work, I was a full-time manager.

By this time disenchantment had set in and I was heading for the Scottish mountains (well, a Model shop in Hampshire really). To fund that I did some occasional contracting, mainly programming (some sympathetic interviewers and a smidgen of BS got me the contracts) and I found two things – one, I was back enjoying my computing and two, it was very lucrative.

Twelve or so years later the shop has gone and I'm still doing bits and bytes contracting. The platforms have changed and I'm much more likely to be using VB or C++ than Cobol. But I'm well rewarded and enjoying developing.

The point? Why take good (happy) developers and promote them to be unhappy managers. Create a post of technician (with lots of grades); developers can be promoted (and be better rewarded) without becoming managers. Pay some budding manager to manage the technicians.

Incidentally, ICL talked about doing this twenty odd years ago but I don't think much came of it.
Anton Britten,
Anton Britten Computing Ltd,
anton@brittena.demon.co.uk
Are there any readers who can supply successful examples of such a strategy? We would be very interested to hear. – Ed.

A salute from an old programmer

Dear Sir,
I always particularly enjoy Peter Collinson's articles (very clear and practical), this month's (October) included: *Avoiding the pitfalls of Perl.*

PS I also enjoyed your editorial on *Old Programmers* (as I'm one, having drifted out of programming into building work), and I also liked Verity Stob's piece.
Alan Leadbetter,
Tunstall, ST6

What's new

Microsoft's reply to the letter by Chris Cant published in the November issue.
As documented, there are architectural differences between Windows 95, Windows 98, Windows NT, and Windows CE, each system implements some elements differently. These differences are relatively few, and are noted in the Platform SDK.

All of the new features of Windows NT4 Service Pack 3, NT5 Beta 1 and NT5 Beta 2 are documented in the 'What's new' section of the documentation as supplied to MSDN Subscribers, attendees of the recent US Professional Developers conference and available to all online at *http://premium.microsoft.com/msdn/library/.*

If you install (or view online) the October Platform SDK, you'll find information in the 'What's new for Windows NT Beta 2' section on the new restrictions in NT5 and Win98 on which applications can set the foreground window.

Unfortunately, we don't currently have a 'Win98 what's new' section. I've contacted our SDK documentation writers and forwarded your feedback to them so that we can correct this for future releases.
Mike Pryke-Smith,
Developer Marketing Manager,
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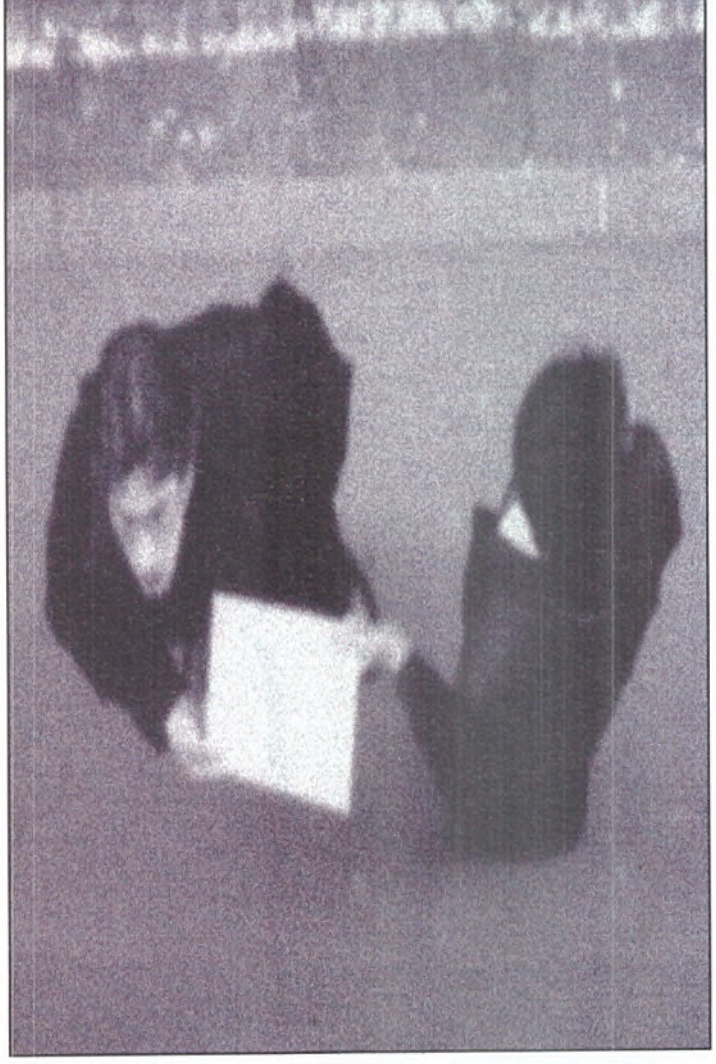
Windows SHELL32 secrets

Shutdowns, restarts, file browsing, and picking icons...Dave Jewell sniffs out the undocumented dialog-based functionality to be found within the Windows SHELL32.DLL library.



It's a few years now since I first wrote an article on the undocumented goodies hiding within the `SHELL.DLL` library. At that time, there wasn't a great deal to talk about. Windows was still unashamedly 16-bit, most of the 'shell' functionality was contained within Program Manager, and pretty well the most interesting thing inside `SHELL.DLL` was the undocumented 'About-box' dialog, which Microsoft invoked from within all its bundled applications and applets. Ho hum...

Well, times have moved on. Today, the 32-bit `SHELL32.DLL` library is a large executable that dwarfs its predecessors. There are a number of reasons for the bloat, the main one being that this library now contains a significant portion of the core functionality used by the Explorer application itself, `SHELL32.DLL` being roughly ten times the size of the Explorer executable.

Microsoft being Microsoft, the goodies contained within `SHELL32.DLL` are largely undocumented, and – as with any undocumented function – you use this stuff entirely at your own risk. However, there's evidence that the software giant is rapidly converging on a single, unofficial 'Shell API' across both the Windows NT and 95/98 platforms. The biggest difference between NT and 95/98 is the use of Unicode string arguments in the former and 'classic' `LPCSTR` strings in the latter. Thus, if you want to develop an application that makes use of these undocumented calls, you'd be well advised to bury the actual SHELL32 API calls inside a wrapper object that takes care of converting strings according to the platform in use. In this article, I'm assuming that you're using Windows 95/98. You have been warned...

As a quick aside, you may have noticed that even the documented versions of the Shell API routines are 'stubbed out' in Windows 95/98 when it comes to the Unicode versions of each call. If you try calling the Unicode versions of `SHBrowseForFolder`, `SHFileOperation`, or `ShellExecuteEx` (to name but three) you'll find that these routines don't do anything more useful than returning zero as a function result!

Shutdown secrets...

Since the `ShellAbout` routine has now been duly documented by Microsoft, we won't waste any time looking in that direction. Instead, let's suppose that you're writing an installer program and you want to be able to shut down Windows in an orderly manner. The conventional approach here would be to use the `ExitWindows` or `ExitWindowsEx` routines to shut down the system in an orderly manner. However, wouldn't it be nice if you could make use of the 'standard' Windows shutdown dialog that's displayed when the user selects `Shut Down...` from the Start menu?

Figure 1 – Here's IDA Pro, my trusty disassembler. This tool understands the format of DBG Symbol files and makes it relatively easy to explore the undocumented internals of Windows NT.

```
procedure ExitWindowsDialog (hWndOwner: hWnd); stdcall;
    external 'shell32.dll' index 60;
```

Throughout this article, I'll be showing undocumented function prototypes using Delphi Pascal code. Not only is this often more concise than the C/C++ equivalent, but it also brings together the function prototype, the name of the DLL containing the function, and the wanted ordinal number all in one simple statement. If you're a C/C++ devotee or a Visual Basic programmer, you should have little difficulty in converting these prototypes.

As you can see, the `ExitWindowsDialog` routine has an ordinal number of 60 and takes a single parameter – the handle of the owning window. If you call this function, you'll be rewarded with the all too familiar dialog shown in Figure 2. As usual, calling this function will automatically cause the entire display area to be 'greyed out' with the exception of the shutdown dialog itself. If you're of a curious disposition and you like poking around inside `SHELL32.DLL`, you'll discover that this is achieved by creating a 'fake' desktop window that overlays the display surface and then `PatBlt`'ing a dithered brush to this window. All this takes place *before* the shutdown dialog is displayed.

Truth to tell, `ExitWindowsDialog` isn't a terribly flexible routine. Under Windows 98, a `wm_Quit` message is posted to the `hwndOwner` window, whereas under NT, the same window handle is passed to a do-nothing stub routine called `ExitToDos`. A more genuinely useful routine is `RestartDialog`, whose function prototype is given below:

```
function RestartDialog (hWndOwner: hWnd; szMsg: PChar;
    dwFlags: UINT): Integer; stdcall;
  external 'shell32.dll' index 59;
```

As before, `hWndOwner` is a handle to the owning window. The `szMsg` argument (remember, this is a 'wide' string if you're running under NT) is a string that's used to provide additional information to the user as regards why the system needs to be restarted. For example, if you make the following call...

```
RestartDialog (Handle,
    'Wombat 3.0 has been successfully installed. ',
    ewx_Reboot);
```

...then you'll get the dialog box shown in Figure 3. Notice that the system appends extra text to whatever message string you supply, so be sure to append a period and a couple of spaces to your text string. The `dwFlags` parameter is a combination of the `EW_xxx` and `EWX_xxx` flags that are supported by the `ExitWindowsEx` routine – see the SDK documentation for a description of these.

There are two extra little 'gotchas' to bear in mind here. First, as with `ExitWindowsEx`, this routine will return to the caller as soon as the shutdown has been initiated, and the system shutdown then proceeds asynchronously. The value `IDYES` will be returned if the punter decided to shutdown the system and `IDNO` if they clicked the Cancel button.

Second, the above being so, it's the responsibility of the calling application to shut itself down – the SDK contains notes on how a Windows 95/98 application should correctly shut down in such circumstances. The SDK contains notes (Article ID: Q149690) on how to create a separate thread that takes responsibility for doing this.

(Tip: both these shutdown dialogs, `RestartDialog` and `ExitWindowsDialog`, implement a secret feature whereby you can force Windows to exit immediately without polling each open application to determine whether or not it's prepared to shutdown. Normally, Windows will send `wm_QueryEndSession` and `wm_EndSession` messages to each application, but if you hold down the Ctrl key before clicking the OK button, then Windows doesn't do this. Internally, the code checks if the Ctrl key is down and, if so, it will 'OR' the `EWX_Force` bit into the flags parameter. This can obviously result in data loss and isn't recommended for use by ordinary punters, but for developers who experience frequent system crashes, and are always having to restart a system with one or more hung applications, this secret feature can save a lot of time.)

Shell hacking for profit and pleasure

Maybe you're wondering how I sussed out all this interesting information? Well, it's a fact that Windows 'archaeology' isn't as easy as it used to be. Back in the good old days, Microsoft used to include a full set of symbolic debug information into its operating system beta releases. Moreover, undocumented API routines generally were exported by name, and the function name always gave you a pretty big clue as to what a particular call was for.

Microsoft has wised up since then, but not a great deal. Nowadays, all undocumented routines are religiously exported by ordinal, making it much more difficult to figure out what's going on. But fortunately, Microsoft still provides a very useful 'Rosetta Stone' in the shape of the symbolic debug files that ship with NT. Using these files, and a debugging tool or disassembler that understands the PDB or DBG file formats, you're well on your way to understanding what's going on 'under the hood'.

A number of different disassemblers will recognise the DBG file format, including the deeply wonderful IDA Pro disassembler (check out the IDA website at *www.daterescue.com*), which you can see running in Figure 1. Unfortunately, Microsoft appears to have changed the DBG file format somewhat in the latest incarnation of Visual C++, but I suspect that a compatible version of IDA Pro will be out soon...

I can see an icon!

Admittedly, restarting the system isn't something you'll need to do frequently (keep quiet at the back there, you JBuilder developers!) but here's a very handy function that can save you a couple of days of programming effort.

```
function PickIconDlg (hWndOwner: hWnd; szFile: PChar;
    nMaxCount: Integer; var IconIndex: Integer):
        Bool; stdcall;
  external 'shell32.dll' index 62;
```

`PickIconDlg` provides access to the shell's icon-picker dialog (see Figure 4). You can see this dialog for yourself if you right-click a shortcut on the desktop, choose `Properties`, and then click the Change Icon button. Similarly, this dialog is accessible from the File Types dialog (`View|Folder Options` in the Explorer).

In essence, this dialog provides a mechanism that allows users to choose an icon that they wish to associate with some item. There's a Browse button through which the user can browse any executable file

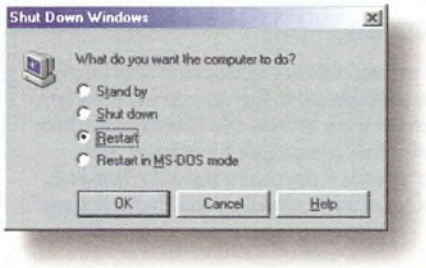


Figure 2 – This is what you'll see when you call the ExitWindowsDialog routine. As you might expect, this is what gets called when you select Shut Down... from the Start menu.

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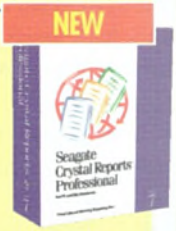

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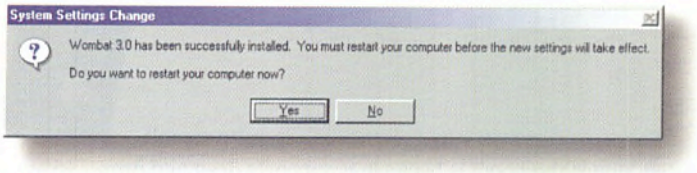


Figure 3 – The RestartDialog function gives fine-grained control over the way in which Windows is restarted, and is particularly relevant to those developing installer software.

(EXEs, DLLs, screen savers, or whatever) that might contain an icon of interest. All the icons in the current file are displayed in the owner-draw list box for quick access.

Using this function is delightfully simple. As ever, the first argument is a window handle to the owning window. This is used as the owner of the dialog box that's displayed. Next comes a pointer to a character buffer (remember, Unicode if running under NT!) that is used to pass an initial filename to the function. When the function returns, this buffer will contain the filename that the user selected.

(Tip: the `SHELL32.DLL` contains a large number of icons used by Explorer itself, and nine times out of ten, you'll want to start the icon browse operation by pointing to the `SHELL32` executable itself. The function provides a handy shortcut to accomplish this – just pass a zero-length string in `szFile` and this will be interpreted as the `SHELL32` library.)

As you'd expect, the `nMaxCount` argument tells the function how big the character buffer is – it's generally a good idea to set this to `Max_Path`. Finally, the `IconIndex` parameter is a `var` argument (a pointer to an integer in C/C++ speak) that returns the zero-based index of the icon in the designated file. If the punter selects an icon, then `True` will be returned as the function result. If Cancel is pressed, then `False` will be returned. An example of the use of this function is given below:

```
procedure TForm1.Button1Click(Sender: TObject);
var
  Index: Integer;
  szBuff: array [0..Max_Path] of Char;
begin
  szBuff [0] := #0;
  if PickIconDlg (Handle, szBuff, Max_Path, Index) then
    ShowMessage (
        Format ('You selected icon %d from file %s',
        [Index, szBuff]));
end;
```

It should go without saying that if you want the icon itself, you can then pass the returned filename and index directly to the `ExtractIcon` API call in order to obtain an icon handle.

Run rabbit run...

Another interesting call is the `RunFileDlg` routine, the function prototype for which is given below, along with other related declarations:

```
const
  { Flags for RunFileDialog call }
  rfd_NoBrowseButton = 1;  // No browse button in dialog
  rfd_NoDefaultItem = 2;   // Don't show a default item
  rfd_DirFromPath = 4;     // Set working dir. from path
  rfd_NoLabel = 8;         // Don't show a label beside
                           // edit box
  rfd_NoMemSpaceChkBox = $20;  // Don't show memory
                           // space check box (NT)

  { notify code from RunFileDlg }
  rfd_Notify = -510;

  { Valid responses from RunFileDlg notify handler }
  rfd_OK = 0;      // OK to run the program
  rfd_Abort = 1;   // Can't run - close the dialog
  rfd_Retry = 2;   // Can't run - let user try again

type
  PRFDNotifyMsg = ^TRFDNotifyMsg;
  TRFDNotifyMsg = record   // notify record
    Header: TNMHdr;
    szFileName: PChar;     // filename
    szDirectory: PChar;    // directory
    nShow: Integer;        // sw_xxxx
  end;

procedure RunFileDlg (hWndOwner: hWnd; Icon: hIcon;
    szDirectory, szTitle, szDesc: PChar;
    dwFlags: UINT); stdcall;
  external 'shell32.dll' index 61;
```

When invoked, this routine displays the same dialog box that you'll see if you choose `Run...` from the Start menu (see Figure 5). In its most basic form, the dialog can be invoked as easily as this:

```
RunFileDlg (Handle, 0, Nil, Nil, Nil, 0);
```

However, a considerable degree of flexibility is built into the dialog. As ever, the first parameter is a window handle to an owning window. The second parameter specifies an icon for the handle that appears in the dialog box. If you pass zero, then the default icon handle will be used. The `szDirectory`, `szTitle`, and `szDesc` arguments specify the working directory, the dialog title string, and the description string that appears above the drop-down combo control in the dialog. Each of these routines can be replaced with `Nil`, in which case default values will be used.

Finally, the `dwFlags` parameter allows you to selectively remove different items from the dialog. If the `rfd_NoBrowseButton` flag is set, then the Browse button isn't displayed, with the OK and Cancel buttons automatically moving over to the right. If the `rfd_NoDefaultItem` flag is set, then the drop-down combo box will be shown with no initial selection. By default, the combo box will contain the name of the last program that was executed using this function. (In any event, this dialog automatically maintains a MRU

Figure 4 – Here's the deeply sexy PickIconDlg dialog doing the business. By default, it will look for icons in the SHELL32.DLL library, which just happens to be where most of the cute icons can be found.

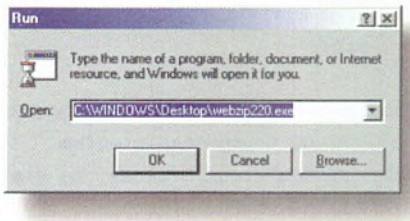


Figure 5 – The RunFileDlg provides a parent notification mechanism for selectively blocking the execution of certain file types – optionally from specific directories. In addition, an undocumented feature enables you to drag and drop files directly onto the dialog box itself.

list – Most Recently Used – with which to fill the combo box.) The `rfd_NoLabel` flag suppresses the display of the small text label immediately to the left of the combo-box whereas the `rfd_NoMemSpaceChkBox` (which is NT specific) disables the display of the memory space check box.

Internally, this routine is somewhat more complex than you might think, for at least two reasons. First, the code includes the ability to post notify messages (`wm_Notify`) back to the owning window. In order to receive notifications, you need to write a notify handler, look for the `rfd_Notify` code, and return one of the three possible responses listed above. In this way, it's possible to give punters the ability to run certain programs and not others. A somewhat whimsical example of a notify routine (written in Delphi) is given below. In this example, the code prevents users from using the Run dialog to open ZIP files, but you could equally well use it to accomplish other nefarious purposes. Bear in mind that the `szDirectory` field passed as part of the notification message will correspond to the value that you passed in to the `RunFileDlg` call.

```
procedure TForm1.TWMNotify (var Msg: TMessage);
var
  NotifyMsg: PRFDNotifyMsg;
begin
  NotifyMsg := Pointer (Msg.lParam);
  if NotifyMsg^.Header.code = rfd_Notify then begin
     if UpperCase (ExtractFileExt(NotifyMsg^.szFileName))
       = '.ZIP' then begin
             ShowMessage ('Sorry, you''re not allowed
                          to run ZIP files');
             Msg.Result := rfd_Retry;
```

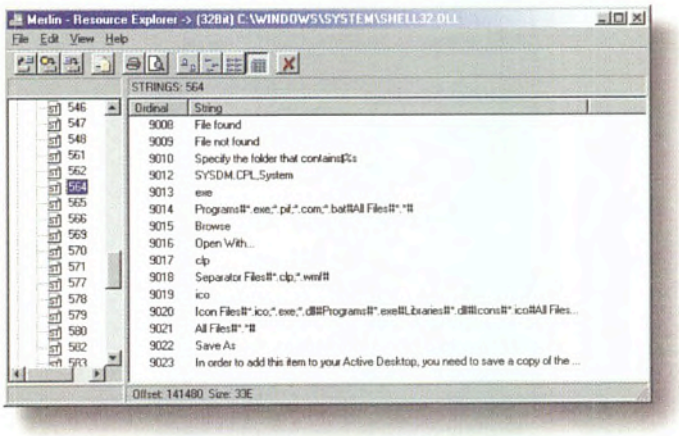


Figure 6 – If you have a resource 'sniffer' (this one is Merlin, a Delphi-based resource exploration tool) you can quickly examine what resource strings are available within SHELL32.DLL, using this as a basis for accessing Microsoft's predefined filters, etc.

```
      end
      else Msg.Result := rfd_OK;
    end;
end;
```

The second reason why `RunFileDlg` is quite complicated 'under the hood' is because it supports drag and drop – strange but true! I honestly don't know whether or not this is a documented feature of Windows 98 (having browsed around the online 'Getting Started' help file, I suspect not) but while poking around in the internals, I discovered that drag and drop is supported. Just ensure that the Run Program dialog is open, and you'll then find that you can drag items from your desktop, or from an Explorer window right onto the dialog, whereupon the corresponding pathname will instantly appear in the combo-box. An utterly useless feature in my opinion (why not launch the item from where it is, rather than dragging it across to the dialog?) but a good party-piece for Windows anoraks.

Easy file browsing

Incidentally, have you noticed how nice and easy to use many of these undocumented calls are? A lot of the routines that take string pointers will, for example, 'do the decent thing' taking some default action if you pass `Nil` (or `NULL`!) as an argument. It's a far cry from the baroque, cumbersome API that non-Microsoft developers often have to contend with. Have you ever silently cursed some nameless Microsoft programmer as you've grappled with the intricacies of the `GetOpenFileName` function and the sadistically complicated `OPENFILENAME` data structure that you have to set up – simply in order to browse for a file?

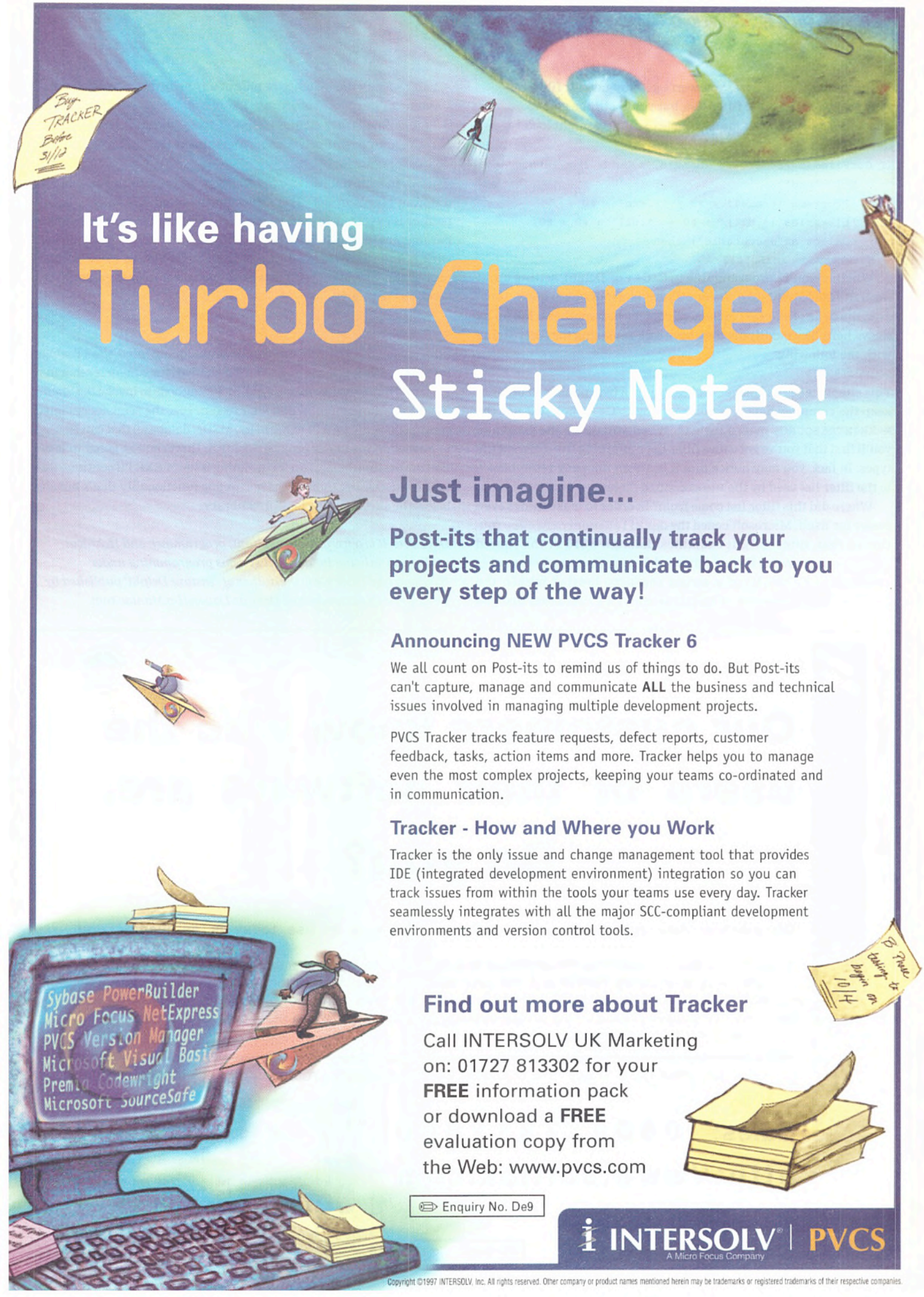
Well, curse no more. Microsoft doesn't bother with such nonsense itself, of course, and now you don't need to bother with it either. Here's the snappily-named `GetFileNameFromBrowse` routine, whose function prototype is given below:

```
function GetFileNameFromBrowse (hWndOwner: hWnd;
     szFileName: PChar; nMaxCount: Integer;
     szStartDir, szDefExt, szFilter, szTitle: PChar):
       Bool; stdcall;
  external 'shell32.dll' index 63;
```

Effectively, this is just a wrapper routine that maps down to a `GetOpenFileName` call. However, because everything is passed on the stack rather than via a clunky data structure, it's a great deal easier to use. Aside from the inevitable owner window handle, `szFileName` is a pointer to a buffer in which the chosen filename will be returned. You can also set up an initial filename in this buffer before making the call. The `nMaxCount` parameter specifies the size of the buffer. And `szStartDir`, `szDefExt`, `szFilter`, and `szTitle` are all arguments that correspond (respectively) to fields within the `OPENFILENAME` structure. The first allows you to set an initial directory for browsing (if `Nil`, it seems to default to the 'My Documents' section of the Explorer namespace), `szDefExt` can be used to designate a default file extension, while `szFilter` is a list of one or more file filters. Finally, `szTitle` provides a title string for the dialog. A value of `True` is returned if the punter chooses a file, and `False` otherwise.

The simplest possible call to this routine might be something like:

```
procedure TForm1.Button1Click(Sender: TObject);
var
  szBuff: array [0..Max_Path] of Char;
begin
  if GetFileNameFromBrowse (Handle, szBuff, Max_Path,
       Nil, Nil, Nil, Nil) then
    ShowMessage (szBuff);
end;
```



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In this particular case, you won't get any default file extension, and you'll have no filter list, but you'll still be able to select files. A somewhat more complex scenario might look like this:

```
if GetFileNameFromBrowse (Handle, szBuff, Max_Path,
    Nil, 'exe',
    'Programs (*.exe)' + #0 + '*.exe' + #0 +
    'Libraries (*.dll)' + #0 + '*.dll' + #0 + #0,
    'Select an executable') then
  ShowMessage (szBuff);
```

Whether you're programming in C/C++ or Delphi, setting up an explicit filter string like the one above is a messy business. However, the `GetFileNameFromBrowse` routine has another trick up its sleeve here. Try modifying the above call, replacing the filter string with the following:

```
PChar (9020)
```

This simply takes an integer, and casts it to a byte pointer in order to keep the compiler happy. If you're using C/C++, then just use the `MAKEINTRESOURCE` macro instead. When you rerun the program, you'll find that you've got a nice filter list containing five different file types. In fact, you may notice that it bears an uncanny resemblance to the filter list used by the `PickIconDlg` dialog.

Where did this filter list come from? In order to make things even easier for itself, Microsoft coded the `GetFileNameFromBrowse` routine so that, internally, it examines the high-word of the passed `szFilter` argument. If the high word is `Nil`, then the low-word is assumed to be the ID of a string resource located within the `SHELL32.DLL` executable. It's a rather annoying limitation that you can't specify the instance handle of any arbitrary executable, but you can't expect everything, I suppose. There are a number of pre-defined filter strings to choose from, as you'll see if you run a resource 'sniffer', such as Merlin, on the `SHELL32.DLL` file (see Figure 6).

In fact, you can use the string resource's ID in a number of different places in the SHELL32 undocumented API when a string pointer is expected. It would be tedious to attempt to delineate which parameters in which calls allow string IDs and which don't, so just suck it and see. As a good rule of thumb: if passing a non-pointer produces a GPF, then you know that you've got to pass an honest to goodness pointer!

Find files

I hope you've found this quick tour of undocumented shell dialogs interesting. This is by no means an exhaustive tour – there is other dialog-based functionality in there too, including code to invoke the Shell's 'Find Files' functionality, and `SHFormatDrive`, the semi-documented routine (look up the API name in the MSDN database) that can be used to format drives under program control. However, I'm going to leave that for the time being. In a forthcoming issue of EXE I'll continue this tour by discussing some of the non-dialog functionality that's lurking below the surface of the SHELL32 library. ■

Dave Jewell is a freelance consultant, programmer, and technical author specialising in low-level systems programming under Windows and DOS. He is the author of 'Instant Delphi' published by Wrox Press. You can contact Dave as Dave@HexManiac.com.

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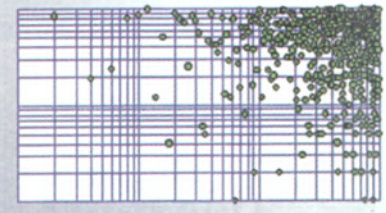

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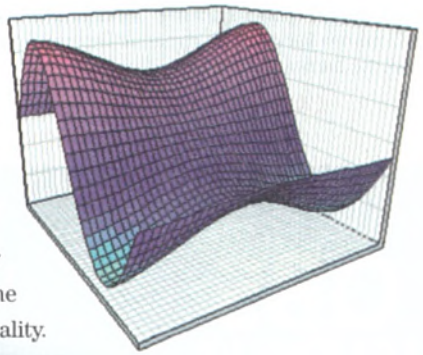

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The SQL tool in your Java toolkit

Chris Drawater takes a close look at SQLJ, an alternative to JDBC for database access through Java.

Java continues to evolve at a relentless pace and the latest Java database technology to arrive on the scene is SQLJ. This is a preprocessor API for embedding static SQL calls within Java code. It is analogous to ANSI style ESQL/C (Pro*C) in that the basic API is portable across different vendor databases.

The SQLJ specification of the API has been developed jointly by the major database companies (including Oracle, IBM, Tandem, and Sybase). This means there is a good chance that for SQLJ code containing SQL92 entry-level conformant SQL statements, the resultant Java classes may be bytecode portable across both deployment platforms and databases.

The SQLJ precompiler translates the SQLJ calls into Java/JDBC calls, which are then compiled with `javac` to use the Java JDBC driver classes of choice (Oracle for the purposes of this article). Versions 1.1 and above of the JDK, which include the JDBC API, are supported for use with SQLJ. During processing, the precompiler parses the SQL and undertakes SQL syntax checking (vendor specific or independent), type checking, and (if in online mode, then via a database connection) schema checking. SQLJ provides support for multiple database connections plus multiple execution contexts against any single connection.

For dynamic SQL, the lower-level JDBC interface is still required. SQLJ and JDBC are both alternative and complementary interfaces that can be mixed within Java code.

SQLJ code

SQLJ API code is designated by the token `#sql`, and contains a SQL statement inside curly braces. The inputs and outputs of SQL statements are passed through Java host variables (either local within object methods or as instance variables). For example, a simple `select` statement:

```
long total_items;
#sql [ctx,ectx] { select nvl(count(*),0) into :
                        total_items from item_billed };
System.out.println("Total items : " + total_items);
```

Or an update followed by a commit:

```
int new_dcode = 42;
int old_dcode = 1111;
#sql [ctx,ectx] {
       update item_billed
   set distributor_code = :new_dcode
   where distributor_code = :old_dcode };
System.out.println("Items updated : " +
                    ectx.getUpdateCount());
#sql [ctx,ectx] { commit };
```

To return multiple rows using SQLJ, an iterator class is used:

```
// after import statements but before class definition
#sql iterator items (String, float );
```

And within the class definition:

```
items  dest_by_value;
String uref = "nothing";
float total_value = 0;

#sql [ctx,ectx] dest_by_value =
     { select reference, sum(value_final)
            from item_billed
            where distributor_code = :new_dcode
            group by reference };
while (true)
{
   #sql {fetch :dest_by_value into :uref,:total_value};
   if (dest_by_value.endFetch())
   {
     break;
   }
   System.out.println( "Destination ref : " + uref);
   System.out.println(" Value : " + total_value);
}
dest_by_value.close(); // close interator
```

Compilation

What is going on under the covers? In very simple terms, SQLJ files are processed via the command line using the `sqljc` utility, which creates intermediate Java files and then invokes `javac` to compile them into class files. (Alternatively you can use `sqlj`, which misses out the `javac` stage.) During the preprocessing, the SQLJ lines are replaced with blocks of Java code, which invoke objects and methods that use JDBC API code.

In reality, this preprocessing creates a whole host of associated class and other files while creating a class file from a SQLJ file. For example, the command `sqljc *.sqlj` would produce the following: a source code-based Java file (including a connection context plus internal class definitions) and a source code-based class file

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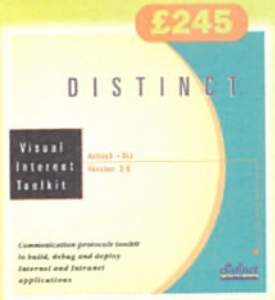

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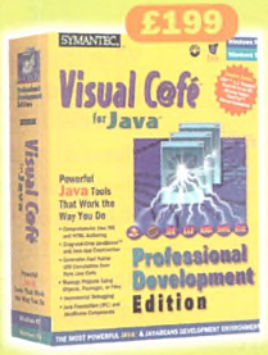

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(compiled from the Java file); internal classes; a resource file (providing information on SQL operations and datatypes); compilation cache files (a cache of verified SQL statements, but only if this is enabled); and a connection context class (the relevance of which is explained below).

Resource files `*_SJProfileX.ser` (where *X* represents a number) contain information about the SQL operations and are used by the SQLJ runtime. They allow for vendor-specific static SQL compilation and optimisation. This information is not easily represented as Java files, but you can view the contents of the resource file using the utility `profp`:

```
profp tx_api_SJProfile0.ser
```

However, the internal classes and resource files should not be used directly by the developer.

The compilation cache files contain the results of online checking and store SQL statements that do not result in error or warning messages. Note that the SQLJ API code is not directly replaced by JDBC code, but by calls to other routines that make JDBC API calls, and so it is not particularly readable.

The last type of file to consider is the property file. These can be used to supply options to the translator. It is in the property file that we specify the connection and semantic checking options that facilitate the SQL syntax checking, type checking, and schema checking. When SQLJ starts to run, it looks for a default property file called `sqlj.properties` in one of three places, in the following order: the Java home directory, the user's home directory, the current directory. Listing 3 shows the property file used to compile Listing 1.

In terms of troubleshooting, the SQLJ runtime includes the `profdb` utility to install a runtime call-tracing capability into SQLJ programs, which operates on the profiles (resource files) associated with a program. For example:

```
profdb tx_api_SJProfile0.ser
```

Together with the use of the JDBC `DriverManager.setLogStream()` method for the tracing of JDBC calls and SQL tracing at the DBMS server, this will aid problem resolution.

A comparison of performance

Operation	Worst	...	Best
Memory usage	SQLJ	JDBC	Tuned JDBC
Execution performance	JDBC	SQLJ	Tuned JDBC
Development time / complexity	Tuned JDBC	JDBC	SQLJ
Applet download time	SQLJ		JDBC/Tuned JDBC

Speed and size of generated code

One obvious question is how does the SQLJ-based code compare to native JDBC code in terms of speed and size?

Well, the preprocessing of the SQLJ source file shown in Listing 1 (`tx_api.sqlj`, 3 KB) produces the following files: `tx_api.java` (an intermediate product really, 7 KB), `tx_api_SJProfile0.ser` (a resource file, 3 KB), `tx_api.class` (3 KB), `tx_api_SJProfileKeys.class` (an internal class, 2 KB), and `defctx.class` (a connection context, 3 KB).

Compilation of the equivalent pure Java/JDBC source file in Listing 2 (`tx_api.java`, 4 KB) produces: `tx_api.class` (3 KB).

```
import java.sql.*;
import cxdthrdb.cxdthrdb;
import sqlj.runtime.ExecutionContext;

#sql context defctx;// for connection context

public class tx_api
{
   Connection con;

   public String generic_discounts;
   public String specific_discounts;
   public float value_of_units;
   public float value_of_gen_disc;
   public float value_of_specific_disc;
   public float value_final;
   public String tx_currency;

   defctx ctx;

   ExecutionContext ectx;

   public tx_api(Connection pcon)
   {
      System.out.println("Setting up sqlj TX API...");

      this.con = pcon; // get hold of DB connection
                       // passed across

      try
      {
         ctx = new defctx(con);
         ectx = ctx.getExecutionContext();
      }
      catch (SQLException ex)
      {
         System.out.println(
               "tx_api.sqlj main : SQL Error...");
         if (con!=null)
         {
         cxdthrdb.sqlerr(ex,con);     // connection so
                                      // rollback
         }
         else
         {
         cxdthrdb.sqlerr(ex); // if no connection
         }
         System.exit(-1);
      }
   } /* end constructor */

   public void fire (
      long tx_distributor_code,
      long tx_c_account,
      String tx_reference,
      String tx_timestamp,
      String tx_uref,
      String tx_item_type,
      String tx_item_specific,
      String tx_item_attributes,
      float tx_no_units,
      String tx_distr_loc_grid,
      String tx_distr_loc_String,
      String tx_service_direction,
      String tx_generation_flag,
      String tx_delivery_channel,
      String tx_delivery_reference,
      String tx_delivery_date,
      long tx_batch_id) throws SQLException
   {

         #sql [ctx, ectx ] { CALL ipricing.mk_pricing (
                  :IN tx_distributor_code,
                  :IN tx_c_account,
                  :IN tx_reference,
                  :IN tx_timestamp,
                  :IN tx_uref,
                  :IN tx_item_type,
                  :IN tx_item_specific,
                  :IN tx_item_attributes,
                  :IN tx_no_units,
                  :OUT generic_discounts,
                  :OUT specific_discounts,
                  :OUT value_of_units,
                  :OUT value_of_gen_disc,
                  :OUT value_of_specific_disc,
                  :OUT value_final,
                  :OUT tx_currency,
                  :IN tx_distr_loc_grid,
                  :IN tx_distr_loc_String,
                  :IN tx_service_direction,
                  :IN tx_generation_flag,
                  :IN tx_delivery_channel,
                  :IN tx_delivery_reference,
                  :IN tx_delivery_date,
                  :IN tx_batch_id)};
   } /* end fire */
} /* public class tx_api */
```

Listing 1 – Example SQLJ source code

It can be seen that although the SQLJ source code is of smaller size than the equivalent JDBC code, the total size of generated files is actually larger.

What about the performance of SQLJ-generated code? When testing execution performance of 28, 583 PL/SQL package function calls, the tuned JDBC (Listing 2) was 20% faster than SQLJ (Listing 1). Interestingly, casual JDBC (an untuned version of Listing 1) was 10% slower than SQLJ code.

However, in the context of a 20 ms per PL/SQL call, the percentage difference is generally insignificant to the user (although it may be important to, for example, high-speed data loaders).

In terms of development time, without the use of an IDE (such as Borland's JBuilder) the SQLJ code is quicker to develop than the equivalent tuned JDBC code.

Multiple DB connections

SQLJ supports connecting to multiple different schemas at the same time. The various schemas used at runtime are modelled as distinct *connection context* classes in SQLJ programs, which allows type checking using the same schemas at translation time. For example:

```
#sql context defctx;   // after import statements but
                       // before class definition
```

And within the class definition:

```
Connection con;
defctx ctx;
ctx = new defctx(con);
long junk;
```

SQL is then executed against a specific connection context:

```
#sql [ctx] junk =
   { VALUES(timedim.gen_timecode('12-dec-1998')) };
                                        // Y2K OK!
```

The connection context object designates a particular database schema (a point of name resolution and authorisation) where the SQL statements will be executed, and the session and transaction in which they are executed.

The execution semantics of SQL operations can be queried and modified via the *execution context* associated with the operation.

There are `getXXX` and `setXXX` methods that read and change the following values which, once set, affect all subsequent SQL operations executed on that execution context:

`MaxRows` – the maximum number of rows to be returned by any query.

`MaxFieldSize` – the maximum number of bytes to be returned as data for any column or output variable.

`QueryTimeout` – the number of seconds to wait for a SQL operation to complete.

In addition, there are execution context attributes that describe the results of the last SQL operation executed:

`UpdateCount` – the number of rows updated, inserted, or deleted during the last SQL operation.

`SQLWarnings` – any warnings that occurred during the last SQL operation.

```
import java.sql.*;
import cxdthrdb.cxdthrdb;

public class tx_api
{
   Connection con;

   public String generic_discounts;
   public String specific_discounts;
   public float value_of_units;
   public float value_of_gen_disc;
   public float value_of_specific_disc;
   public float value_final;
   public String tx_currency;

   CallableStatement plsqlproc;
            /* handle for executing stored proc calls */

   public tx_api(Connection pcon)
   {
      System.out.println("Setting up JDBC TX API...");

      this.con = pcon; // get hold of DB connection
                       // passed across

      try
      {
         plsqlproc = con.prepareCall("{call
            ipricing.mk_pricing(?,?,?,?,?,?,?,?,?,?,?,?,
                                ?,?,?,?,?,?,?,?,?,?,?)}");
         plsqlproc.registerOutParameter (10, Types.VARCHAR);
         plsqlproc.registerOutParameter (11, Types.FLOAT);
         plsqlproc.registerOutParameter (12, Types.FLOAT);
         plsqlproc.registerOutParameter (13, Types.FLOAT);
         plsqlproc.registerOutParameter (14, Types.FLOAT);
         plsqlproc.registerOutParameter (15, Types.VARCHAR);
         plsqlproc.registerOutParameter (16, Types.VARCHAR);

      }
      catch (SQLException ex)
      {
         System.out.println(
               "Error setting up JDBC TX API...");
         cxdthrdb.sqlerr(ex,con);
         System.exit(-1);
      }
   } /* end constructor */

   public void fire (
      long tx_distributor_code,
      long tx_c_account,
      String tx_reference,
      String tx_timestamp,
      String tx_uref,
      String tx_item_type,
      String tx_item_specific,
      String tx_item_attributes,
      float tx_no_units,
      String tx_distr_loc_grid,
      String tx_distr_loc_string,
      String tx_service_direction,
      String tx_generation_flag,
      String tx_delivery_channel,
      String tx_delivery_reference,
      String tx_delivery_date,
      long tx_batch_id)
   throws SQLException
   {

         plsqlproc.setLong(1,tx_distributor_code);
         plsqlproc.setLong(2,tx_c_account);
         plsqlproc.setString(3,tx_reference);
         plsqlproc.setString(4,tx_timestamp);
         plsqlproc.setString(5,tx_uref);
         plsqlproc.setString(6,tx_item_type);
         plsqlproc.setString(7,tx_item_specific);
         plsqlproc.setString(8,tx_item_attributes);
         plsqlproc.setFloat(9,tx_no_units);

         plsqlproc.setString(17,tx_distr_loc_grid);
         plsqlproc.setString(18,tx_distr_loc_string);
         plsqlproc.setString(19,tx_service_direction);
         plsqlproc.setString(20,tx_generation_flag);
         plsqlproc.setString(21,tx_delivery_channel);
         plsqlproc.setString(22,tx_delivery_reference);
         plsqlproc.setString(23,tx_delivery_date);
         plsqlproc.setLong(24,tx_batch_id);

         plsqlproc.executeUpdate();

         generic_discounts = plsqlproc.getString(10);
         specific_discounts = plsqlproc.getString(11);
         value_of_units = plsqlproc.getFloat(12);
         value_of_gen_disc = plsqlproc.getFloat(13);
         value_of_specific_disc = plsqlproc.getFloat(14);
         value_final = plsqlproc.getFloat(15);
         tx_currency = plsqlproc.getString(16);
   } /* end fire */
} /* public class tx_api */
```

Listing 2 – Example (tuned) JDBC code (equivalent to Listing 1).

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Enquiry No. De14

Technology

The examples are taken from a multi-threaded Java application developed using the JDK 1.1.6 and Oracle SQLJ Reference Implementation Beta 0.7.1.1.

Database access was via the Oracle JDBC-Thin driver (release 8.0.4.2.0) to Oracle v8.0.4 running on Intel NT 4.0.

A SQL operation can be associated either explicitly or implicitly with an execution context. If no execution context is specified, then the default context associated with the connection context used in the operation is (implicitly) used. (If neither a connection context nor an execution context is explicitly supplied, then the execution context associated with the default connection context is used.) Alternatively, an execution context can be declared and supplied explicitly as an argument to the SQL operation:

```
ExecutionContext ectx = new ExecutionContext();
#sql [ectx] junk =
   { VALUES(timedim.gen_timecode('12-dec-1998')) };
```

When explicit execution contexts are used, each SQL operation may be executed using a different execution context instance. If an explicit connection context is also being used, both may be passed as arguments to the SQL operation:

```
#sql [ctx, ectx] junk =
   { VALUES(timedim.gen_timecode('12-dec-1998')) };
```

Note that SQLJ can be used to write multi-threaded applications. The SQLJ runtime supports multiple threads sharing the same connection context (subject to the synchronisation limitations of the underlying JDBC driver). Connection contexts may be safely shared between threads, but execution contexts should not be shared. If an execution context is shared, and multiple threads are executing SQL, the results description of a SQL operation performed by one thread will be visible and overwriteable by other threads and so may result in overwrite problems or runtime errors. To avoid problems, have each thread use a distinct execution context whenever a SQL operation is executed on a shared connection context.

Applicability...

When do you use SQLJ and when do you choose JDBC for your application code? Well, SQLJ probably has the following advantages over using native JDBC:

- Source code is easier to write and read – useful for RAD
- Source code is more compact
- It's similar to ESQL/C in concept
- SQL syntax checking, type checking, and schema checking is performed at compile time (instead of at runtime)
- A generated class has better performance than poorly written JDBC
- Portability (assuming SQL92 entry-level conformant SQL)

But on the downside:

- It generates extra components (class/resource files) all of which have to be managed and then downloaded to a browser
- You end up with more code than you would if you used raw JDBC, which has implications for the speed of download
- Tuned JDBC-based classes perform better than SQLJ generated classes
- Not so easy to control memory usage/application leakage as JDBC

From this I would suggest that potential uses for SQLJ-based code might include everyday application code, RAD, use of static SQL, and prototypes (which don't end up as the final version) for high-performance and memory-critical code

Consider avoiding using SQLJ for: high-performance applets; execution performance-critical code or memory-critical code, where code is executed millions of times; when you require high speed downloading to a browser; and the use of dynamic SQL.

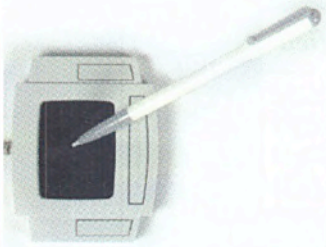
Both SQLJ and JDBC offer portability of generated Java classes across platforms and databases. A general comparison of SQLJ, JDBC, and tuned JDBC against various performance considerations can be seen in Table 1.

As a generic database technology usable across a variety of databases, SQLJ fits well into the database professional's toolkit alongside ESQL/C, SQL, and Java. With the mainstream introduction of SQLJ with Oracle v8.1, in terms of commercial applicability, it is beginning to live up to its potential. ■

Chris Drawater has been working and performance-troubleshooting with RDBMSs since 1987. He can be contacted by email at drawater@compuserve.com.

```
###
### Settings to establish a database connection
### for online checking
###

### turn on checking by uncommenting user
### or specifying the -user option on the command line
sqlj.user=chris
sqlj.password=chris
sqlj.driver=oracle.jdbc.driver.OracleDriver

### Oracle JDBC-OCI7 URL
#sqlj.url=jdbc:oracle:oci7:@

### Oracle JDBC-OCI8 URL
#sqlj.url=jdbc:oracle:oci8:@db8

### Oracle JDBC-Thin URL
#sqlj.url=jdbc:oracle:thin:@<host>:<port>:<oracle_sid>
sqlj.url=jdbc:oracle:thin:@cxd2:1521:db8

### Warning settings
### Note: All settings must be specified TOGETHER
### on a SINGLE line.

# No portability warnings about Oracle-specific
# extensions to SQLJ
#sqlj.warn=noportable

# Turn all warnings off
#sqlj.warn=none

# Turn all Info messages off
#sqlj.warn=noverbose

###
### Online checker
###

### Oracle-specific checker:
sqlj.online=oracle.sqlj.checker.Oracle8JdbcChecker

### JDBC-generic checker:
#sqlj.online=sqlj.semantics.JdbcChecker

###
### Offline checker
###

#sqlj.cache=on
sqlj.offline=oracle.sqlj.checker.Oracle8OfflineChecker

###
### Settings for the SqljDemo example
###

#sqlj.user@DemoCtx=scott
#sqlj.url@DemoCtx=jdbc:oracle:oci8:@
#sqlj.password@DemoCtx=tiger
```

Listing 3 – Example sqlj.properties file (used to process Listing 1).



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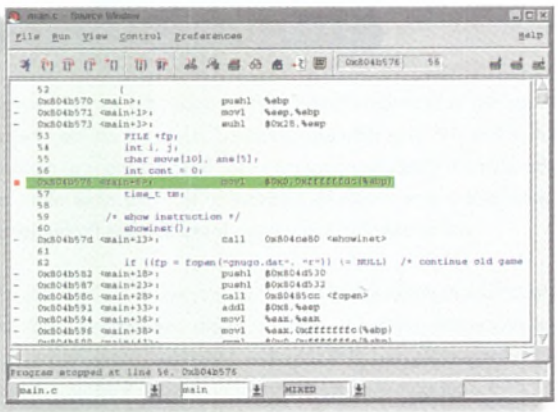

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Enquiry No. De17

Don't you just love being in control?

Ian Murphy reviews the Software Configuration Management offerings from Rational Software, StarBase, Intersolv, and MKS.

Source code control is a necessary part of any development. In fact, I even use it to manage many of the more complex articles I write, as well as for developing training materials. This control, as mentioned above, needs to be part of the development environment as well as being easy to use. In order to work on their code, developers need to be able to open files – if the source code control mechanism manages this via the file open mechanism, then it has become part of that environment.

It needs, however, to go further in ensuring that it is difficult for developers to circumvent the process, and the solution here is to use a repository in which the code is stored. Managing multiple users is critically important because you don't want developers overwriting changes being made by other members on a team. This management also needs to extend to the role of individual developers to ensure that they cannot change code for which they have no responsibility.

Finally, the Software Configuration Management (SCM) tools need to track the state of code: from development to approved for testing, and from failed testing through to fixed and submitted for retest. In this last phase, they need to be able to interoperate with the testing tools. This interface needs to be able to manage the notification to the test tools that a piece of code has been released for testing, as well as taking information back on the pass or fail status and any additional information. If you are using manual testing, then you need an interface that people are comfortable with, and if you are using automated testing, then you need to decide on how to return the information. Simply updating the SCM tool to say a piece of code failed is not sufficient; you need information about why it failed, what happened on failure, and the severity of the failure. This can be done only by proper analysis of the test result and thus makes automatic population of the SCM system from the test system very difficult.

Choosing an SCM tool is, therefore, not a simple matter. I have looked at tools from four different vendors: Rational Software, StarBase, Intersolv, and MKS. (SourceSafe is missing from the review because Microsoft was unable to provide the software on time.)

ClearCase from Rational Software

ClearCase, ClearCase Attache, ClearCase MultiSite, ClearGuide, and ClearQuest make up the tools reviewed from Rational Software. The first four tools ship in a single box as ClearCase while ClearQuest is a separate product but necessary if you are to make a comprehensive SCM tool out of Rational's offerings.

ClearCase is designed to run on both Windows NT and Unix with the exception of ClearCase Attache, which runs on all Microsoft platforms while ClearQuest runs only on Windows 95/98 and NT. ClearCase is aimed at the high-end development team and is an extremely comprehensive but, in places, overly complex product.

Rational makes a clear distinction between Software Configuration Management and Change Request Management. This leads to a need for organisations to purchase both ClearCase and ClearQuest. ClearCase is designed to be a complete lifecycle management tool allowing for software design, builds, and modifications to be managed from a central secure system.

Underpinning the ClearCase development environment is a secure repository that can be accessed only via the ClearCase toolset. While some might feel that this is a little restrictive, such control is critical to the management of complex software development. In order to maintain flexibility, ClearCase allows you to structure your code such that each component has its own separate VOB (Versioned Object Base).

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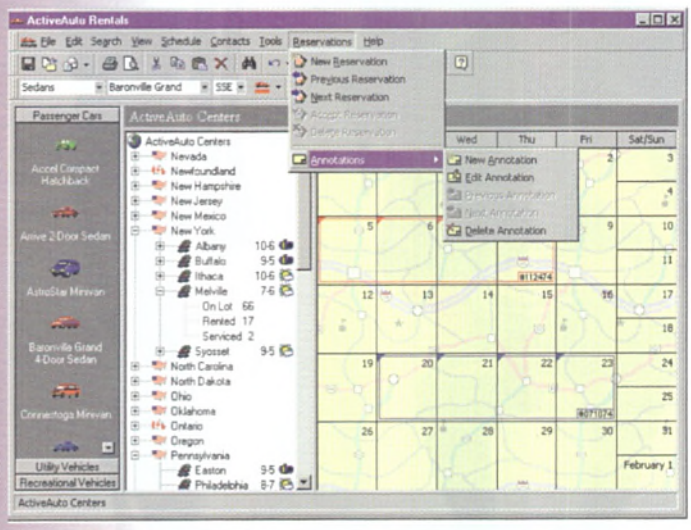

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CONTEMPORARY software

Enquiry No. De19

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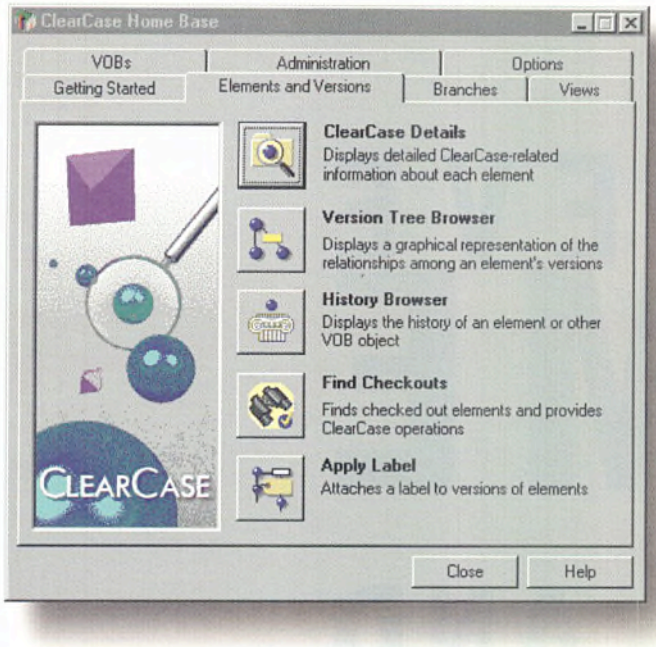

Figure 1 – Rational Software's ClearCase.

Such partitioning of code means that administrators can easily structure their code to match the project teams under their control with shared and private structures. It helps management of parallel development whereby several developers might need to work on the same piece of code. To achieve this, you simply create multiple branches of a particular piece of code and later in the tree, when the parallel development needs to be brought together, you can simply merge them back into a single tree.

The idea of using VOBs in this way can be enhanced when the ClearCase MultiSite product is added into the mix. ClearCase MultiSite enables the distribution of the repository across the organisation and this distributed mechanism even has its own scheduler so that synchronisation can be merged into other network management tasks.

Some tasks carried out by ClearCase require certain privileged access to your registry, and ClearCase has a tool that can be set to run on your server to advise on potential access problems. I don't like just giving tools access to the registry, particularly where this necessitates altering the `Winreg` subkey under Windows NT 4 to allow the product remote access.

Initial creation of users and groups is given over to the operating system with ClearCase, and while this is an elegant solution to access control it does lack the flexibility of simulating project teams. You will also need to ensure that you take care to create accurate startup scripts or batch files for each user if they are to be able to access the VOBs when they log on.

Take care to tune access to local storage via global pathnames depending upon your operating system, as a user working on two different platforms may experience severe difficulties accessing their storage areas. With Windows NT and Novell NetWare there are tools that allow you to migrate user and group accounts between the two operating systems. Unfortunately, there are no such tools between Windows NT and Unix, so in a mixed environment you may need to consider standardising naming conventions if you haven't already done so.

ClearCase Attache is designed to provide a client interface to the ClearCase servers on your Windows NT and Unix boxes. You can either use the Attache GUI or you can use it from the command line. The latter is likely to appeal to programmers who work across the Microsoft and various Unix platforms or those who just prefer keyboard to mouse. Rational has worked hard to make ClearCase integrate with Visual C++, Visual J++, and Visual Basic, but there the integration appears to end. Support for other environments is only likely to be available if Rational feels that there is significant market demand.

Checking code in and out is very simple and ClearCase handled conflicts easily, allowing you to either branch or check-out while in read-only mode. Once you have decided that you wish to carry out a code build, you have the choice of two built-in make tools or you can use your own favourite. Using the built-in tools can make perfect sense because ClearCase allows you to create a build plan that can be used to test software fixes quickly for compile time problems and to add updated components into your deliverable software.

ClearQuest

ClearQuest is not really an SCM tool but provides a Change Request Management tool for the ClearCase family. Like ClearCase Attache, it will install on Windows 95/98 platforms as well as NT. Surprisingly, when you install the CD it does not auto run: you have to locate and run the `setup.exe` file yourself. You will need to go through the `readme.txt` file carefully as this is the first version of the product and it contains some very interesting information. For example, you need to install the Microsoft Data Access Controls v1.5 or higher for ClearQuest to work.

Rational supplies this on the CD and it installs ODBC drivers for Microsoft SQL Server, Microsoft Access, and Oracle. It also installs ODBC components, OLE DB components, Microsoft ActiveX Data Objects, and Microsoft Remote Data Objects, and you will need just over 9 MB of disk storage. Also on the CD are the service pack releases for Windows 95 and Windows NT SP3 – a required step if you want to ensure that the installer has everything necessary to set up your program successfully. In some environments, however, this could cause a conflict with corporate installation rules.

The installation adds three programs to your desktop: ClearQuest, ClearQuest Designer, and ClearQuest Import. The first to start with is the Designer tool, which is your management tool for ClearQuest. At the basic level, it creates your schemas and databases for managing your projects and, while it is important to get this right, any

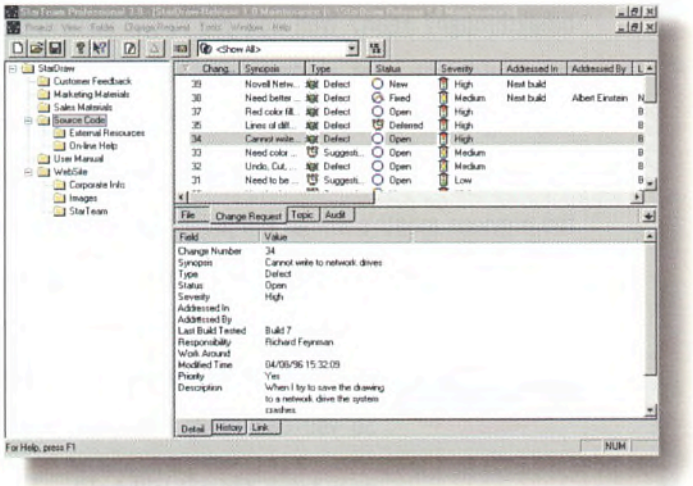

Figure 2 – StarTeam change request.

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The evolution of SCM

Software Configuration Management (SCM) has moved on a long way in the last few years. For many older programmers it simply means source code control, but today it has much wider implications for the workplace.

Take a look around offices today and see how report writers are keeping versions of their reports. Users of word processing software are passing documents via email in such a way that changes made by different users are being maintained within the document. This is because users have realised that the flexibility of word processing has created an environment where they often edit out material that they later end up having to put back in. Microsoft Word even has a compare feature between two versions of the same document.

The corporate website is also being brought into the SCM fold as website managers realise that they need tools that allow them to develop their sites professionally. Much of the need here is to enable the management of project *teams* building websites, and the management challenges presented by fast changing sites are no different to those faced by project managers involved with the development of complex software. (See *Managing a web of change* EXE, November 1998, Andrew Ward's review of Continuus/WebSynergy for website control.)

While sales of SCM tools have been increasing at a rapid rate over the last few years, the software development community has remained generally wary of the tools that are available. In the last few months I have talked with programmers from large, medium, and small companies and most of them are very sceptical about the benefits that they could derive from SCM.

One of their prime concerns is the issue of control. There appears to be a belief that using an SCM tool will increase the amount of time it takes to fix code and that it will become a significant burden on the programmer rather than management. This was very much the view of programmers from small companies who, while accepting that sometimes they could use a better mechanism to track their code, said they didn't have the resources available to use SCM tools.

Another prime issue is the number of programming languages and development environments that different SCM packages support. Many organisations use a wide variety of languages and related tools, and any SCM tool should be integrated with the development environment. For developers in medium and large sized organisations this concern seemed to be almost universal.

In very large organisations the issue of integration with other types of tools such as for design and testing were raised, as was the need for the tools to fit into the wider development cycle, particularly n-tier developments.

The SCM world has changed

What has been happening in the SCM world and what benefits and drawbacks are there in using the tools? What tools are available and how can they be adapted to work for you rather than against you?

SCM has come a long way since the days of source code control systems where the use of the tools was not an integral part of the development cycle, rather it was a mechanism enforced by project teams leaders. The tools themselves enabled developers to find ways to beat the system because they often just held copies of source files in specific directories to which everyone had read and write access. Developers would copy code into their own working directories, until they were happy with what they were doing, copy code back in, and check if anyone else had been doing changes. Management of such systems was also very clunky and any reporting mechanisms to be found were very limited.

Today we have tools that work across the entire development cycle and this has become increasingly important. Developing software today is no longer a linear process; it has become an adaptive, iterative process that needs to be managed. Design tools are making a comeback after the problems of early CASE tools. Structured testing is becoming part of the corporate mentality, at last, with developers having access to code verification tools. And professional QA teams are using comprehensive testing tool environments, such as the Mercury TestSuite from Mercury Interactive and Performance Studio from Rational Software.

Design tools now produce code, as well as producing both the system and programming specifications, so they need to populate the SCM tools. These same specifications are vital for the test environments and therefore design tools need to pass this information to the test management tools.

changes can be propagated back into your database. Rational has ensured that you need to check-out and check-in your schemas, thus ensuring that you actually use source code control for managing the tool as well as your projects.

Creating a database is extremely easy, but the power resides in the management of the different record types. There are two primary types: ordinary or stateless. Each has its own set of associated sub-records and Rational provides a number of default fields while allowing you to add and develop your own. Each field can be assigned help information, default values, list values, and can be made mandatory.

You can design forms to mimic the way information is currently recorded and, if migrating from another tool, this would allow you to build forms to mimic your existing tool, thus minimising the impact on your developers of changing tools. At this point you can use the ClearQuest Import tool to bring data across from your previous tool or fault tracking system.

I would strongly suggest spending time here playing around with creating your own schemas, adding fields and help screens, and becoming comfortable with building custom databases. The Designer tool also manages your users and groups. This is a very clean interface that allows you to allocate any particular user or group to a database while assigning them a role that determines just what they can do within the tool.

ClearQuest is the user interface tool and its effectiveness is limited by the job done in the Designer tool. In addition, it can be accessed via web scripts, although these are available only when using Microsoft's Internet Information Server (IIS) at the back end. This is likely to severely limit the tool in large environments. While the Designer impressed highly, Rational Software really does need to consider small development environments and add source code control functionality to this product. After all, ClearQuest uses it already, so it can't be that much of a jump.

The web interface needs rethinking to provide connectivity to other widely used web tools. And the introduction of other ODBC drivers would help the product establish a good foothold in the market.

StarTeam from StarBase Software

StarTeam is an SCM tool that has recently been getting a significant amount of press attention. One of the reasons for that is because the company has taken steps to ensure that comprehensive facilities do not necessarily have to mean complex working arrangements.

The product comes on two CDs, with the second CD containing tutorials that take you through the product in a reasonable depth. One of the goals of any tutorial is to ensure that the user is able to use it as a jumping off point into a product. Many users will actually use the tutorial as an outline for their first work, and this is easy to do with StarTeam. Surprisingly, the tutorial has sufficient depth to bring users back again to discover new features and facilities.

For the development team, there are two components that need to be installed: StarTeam Virtual TeamServer, which provides the security, repository, and management tools, and StarTeam Professional, which is the component that sits on the desktop. If the users are to be involved in testing and reporting problems, then you can install StarTeam Web Connect that ships as part of StarTeam Virtual TeamServer.

Creating and using projects requires that the Virtual TeamServer is installed and running. This could be on the local machine or across the network and there is good support for all common protocols. The first step is to ensure that user and group accounts have been created in the repository. Unfortunately, StarBase has still decided against tighter integration with the Windows NT Security Accounts Manager, which means that you cannot simply import existing user accounts and provide a single password environment. This is a drawback as experience shows that the number of users of a product drops off when they are required to use multiple logons and passwords. This is particularly important if you use password-ageing mechanisms.

The next step is to create the project and this is simply a matter of following the relevant wizard that will create any required directories for you. You can then drag and drop any existing files into the project directory, highlight them, right click, and choose to add them into the project. At this point they are given a record in the repository that is used to track their progress. Any work now carried out on these files requires that they be checked out and then in again at the end of the session.

This can then be tracked through the audit mechanism and through the system reports. A warning: the audit trail can grow significantly, particularly if you have a small team working on a project with a large number of files, such as the development of a corporate intranet site. I therefore recommend that you remember to compress regularly and get in the habit of breaking big projects into smaller ones where they can be completed easily and then effectively backed up. Combining work can be a project in its own right.

One nice feature of StarTeam is the way it simulates conferencing environments by providing discussion areas for developers. If you can persuade your developers to buy into this mechanism, then all comments on the development of a piece of code can effectively be linked together, and they can later be used to refine specifications and for documentation. An additional benefit is that this information can be used for the creation of test plans as it provides an insight into the developers' goals for a piece of code.

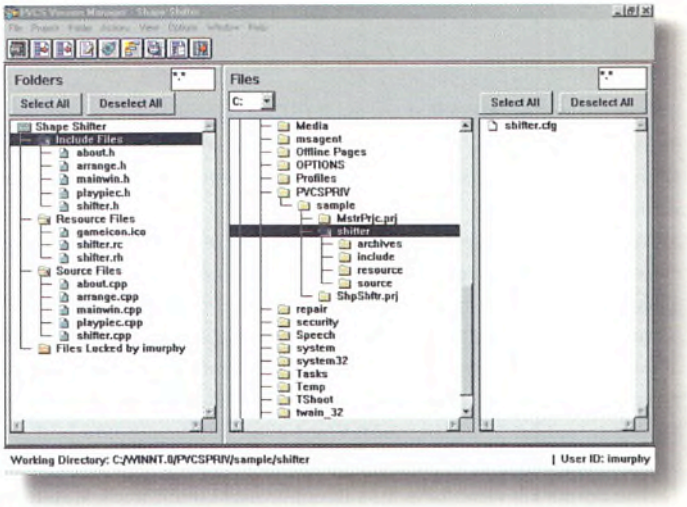

Figure 3 – The PVCS IDE.

This same mechanism is used in the change request management interface and StarBase, like all the other vendors, has added a web interface here. One reason that I like StarTeam is the fact that all the change requests are stored in this conferencing format. It means that I am using an interface that I use for large amounts of the day in other areas, and therefore adding and reading information does not mean learning a new navigation process. This benefit is also valid for the testers reporting problems and those users who would like to see enhancements to the system.

The thing that most lets down the StarTeam products is the severe lack of reporting, both predefined and user-definable. Any tool needs to have effective reporting for management capabilities and despite previous criticism of this, StarBase appears to be unwilling to make any improvements in this area.

PVCS from Intersolv

No one would doubt that Intersolv is the market leader in SCM tools, and has been for several years now. One of the problems about being the market leader is that you are always there to be shot at and an upgrade to your product may receive much less attention than the same upgrade for a competitor. Market leaders are sometimes also guilty of complacency and they tend to lag a little behind the competition in terms of new features and responsiveness to changing market requirements. Not so with Intersolv, which appears to be working as hard to maintain its market dominance as Rational Software, MKS, StarBase, and others are to take it away.

The Intersolv products I looked at were PVCS Configuration Builder, Notify, Tracker, SiteSync, Version Manager, and Process Manager.

PVCS Version Manager makes it very easy to create project teams and to manage their access to projects. PVCS controls the access to your software, not only via the traditional user and groups mechanism, but also allowing you to specify roles for management. These roles are important because it means that you can assign permissions to promote or change the status of a piece of software based on role rather than group. As a result, you can create much tighter management structures and better mirror organisational structure through the balance of user, group, and role.

Like other products reviewed here, PVCS Version Manager allows for parallel development thus allowing it to scale to the larger enterprise. Taking this further, it allows for build configuration by using

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rule-based branching so that each build can use conditional logic at compile time. One example might be to ensure that the relevant language help file is incorporated when projects are compiled based on the country to which the product will ship.

In addition, the Configuration Builder is an automated tool that, once defined, keeps track of version changes to software so that it will always use the latest release version of the code when creating executables. As well as using an audit trail mechanism to achieve this, the Configuration Builder scripts are compatible with Microsoft Visual C++ and can easily be adapted to the make files used by your Unix system.

The PVCS Tracker utility provides the change request management (CRM) features for the Professional edition. Tracker is very tightly bound to PVCS Version Manager and this is extremely important given that CRM must become part of the overall environment both for testers and developers. Tracker was extremely impressive in its reporting capabilities and this was good to see. Managers need to understand what is happening in the repair/upgrade cycle and this can only be done through effective reporting. Many of Intersolv's competitors rely on weak reporting and this is a drawback for large development teams.

Tracker relies on external databases to maintain its information and is designed to sit on the popular relational databases. Unlike some products, which seem to force you to accept their database design, you can really go to town with customising the Tracker database to best meet your requirements. This is extremely useful as you could use it to integrate Tracker with your own Helpdesk software. Such integration would enable bugs and change requests to be logged via the help desk rather than taking time away from developers.

Intersolv has taken into account the growing use of web interfaces within today's software and as such PVCS Tracker has its own web API, allowing it to integrate with the more popular web authoring tools. This is a good example of SCM tools entering new areas as well as demonstrating to management that there are professional tools for website design and maintenance. The web interface will even integrate with your email system to ensure that you have email and Internet access.

The use of API integration is not just limited to the PVCS Tracker web interface; it is also the mechanism that Intersolv uses to link its Developer's Toolkit to different applications and development environments. Although you can use the interfaces supplied by Intersolv, if your environment is not supported, then you can create your own adaptation. Alternatively, consider asking in the newsgroups devoted to your application environment if anyone has already created an interface. For smaller development shops, this could be a good way to develop expertise in PVCS and get themselves known in the wider market.

The acquisition of SQL Software and the rebranding of its tools as PVCS Process Manager have given Intersolv a boost into the large-scale development market. Process Manager now allows Intersolv to track from the design stage through to its traditional market of source code control. This is extremely important as Intersolv now finds itself with a heavy weight competitor such as Rational Software attacking its traditional SCM market.

Process Manager could prove to be the tool that finally gives Intersolv the recognition it deserves, outside of experienced project teams. The product is firmly aimed at the business analyst carrying out business process design, and its integration with the other PVCS tools mean that you can now move from design to development within the Intersolv product range. This linkage is extremely important as it maintains a common interface and toolset for complex development.

Source Integrity from MKS.

Source Integrity from MKS is a bit of a dark horse. During installation of the product you become aware of just how many different software products it integrates with, and these range from traditional development tools to web design environments. This high level of interoperability is undoubtedly one of the keys to the recent success of MKS: it has sought to add support for a wide range of newer environments while still supporting products such as FoxPro and Microsoft Fortran.

Getting to grips with managing MKS took a little more time than expected and there was a point at which it seemed that the product was trying to make life much more complicated than it needed to be. This was partly due to some of the terminology used and partly because I only had a license for a single user, so trying to create a database for several users to connect simultaneously was not possible.

MKS is very aware that the traditional market for SCM tools has widened appreciably over the past year. As a result, the product includes a lot of wizards that are designed to help you through installation, project creation, and user configuration. MKS has also ensured that its Web Integrity system is now an integral part of the finished product and thus access to Source Integrity can be done from a standard installation or via a web interface.

MKS terms the user area a sandbox and this is where all your files are held when working offline. The term is really rather apt. After all, most developers I've come across are big kids and get very possessive about their toys (sorry, code). To meet the requirements of parallel development, and because you may often need to work on different versions of the same project, MKS has created Variant Sandboxes, which enable you to keep each version of a project that you are working on separate from another.

User management is done within Source Integrity and this is something that MKS needs to look at carefully. Few developers work in an isolated environment today and MKS could be designed to use the Unix, Windows NT, or Novell NetWare user account models to simplify life for administrators. Such a move would ensure single logon capability and enable the use of the operating system security models. There would be the added benefit of using the disk security mechanisms within these operating systems to enhance security and access control.

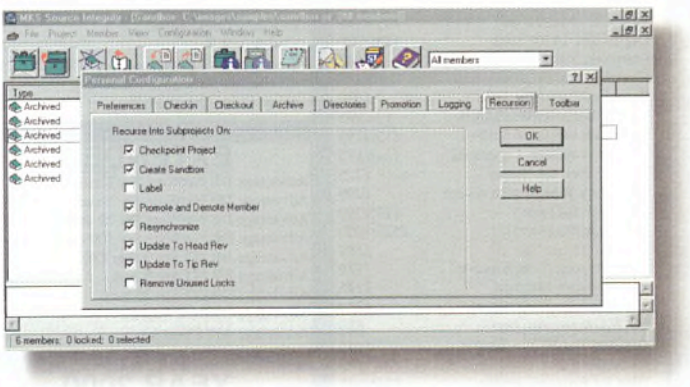

Figure 4 – MKS Personal Configuration.

Version control + teamwork = productivity

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Enquiry No. De22

Linking with different development environments is remarkably easy and MKS has included event triggers that fire upon a whole range of actions. These triggers can be assigned to individual code segments or can affect the global areas, something that is ideal for those managing large project teams.

In order to extend Source Integrity and add change request management, MKS has now completed the integration of Track Integrity, formerly called Under Control. This integration includes the addition of a web interface as well as a good solid reporting engine to track the progress of bug fixes and software enhancements.

The best mix

All of the SCM vendors are keen to see the market for their products expanded. However, some are being more successful than others in ensuring that they can provide the best mix of power and accessibility. At the high end, SCM is now firmly established at the start of the complete development cycle and with the introduction of Process Management we are seeing SCM appeal to designers as well as project teams. Both Rational Software and Intersolv need to do more to complete the integration of their different offerings. Intersolv is almost there and with its PVCS Professional product is able to address both the high end and the general market. Rational Software, on the other hand, has to decide where it is interested in growing. At present, the company is focused on medium to large development shops with ClearCase. ClearQuest would allow it to compete with Intersolv and attract the small to medium shops as well as those looking for an SCM system for their web development tools. Unfortunately, Rational needs to commit itself fully to ClearQuest and add substantial functionality if it is to provide a properly integrated solution.

The other vendors whose products I have looked at all have their own primary markets. MKS is very focused on development environments and this is evident in the number of links they have to different environments. StarBase is a much more user-friendly tool that is selling extremely well at the low end of the market and in sites that are keen on providing a development team approach to their websites. However, PVCS Professional currently controls the market and there is little evidence here that they are likely to lose that stranglehold to any of these competitors.

At the end of the day, SCM tools are necessary if you are to ensure that you have a solid, controlled, development environment. The advance of these tools over the last few years has been driven by the changing development market and by the need for toolsets that can really support distributed development. The emergence of other business-critical markets such as website management has also provided a new market for the vendors to which they appear to have responded. ■

Ian Murphy is a freelance journalist and trainer because it means getting lots of toys, access to some neat technology and gives his ego an outlet. When pressed, Ian will go out and do consultancy. If desperate, you can contact him at ianmurphy@fleet-street.com.

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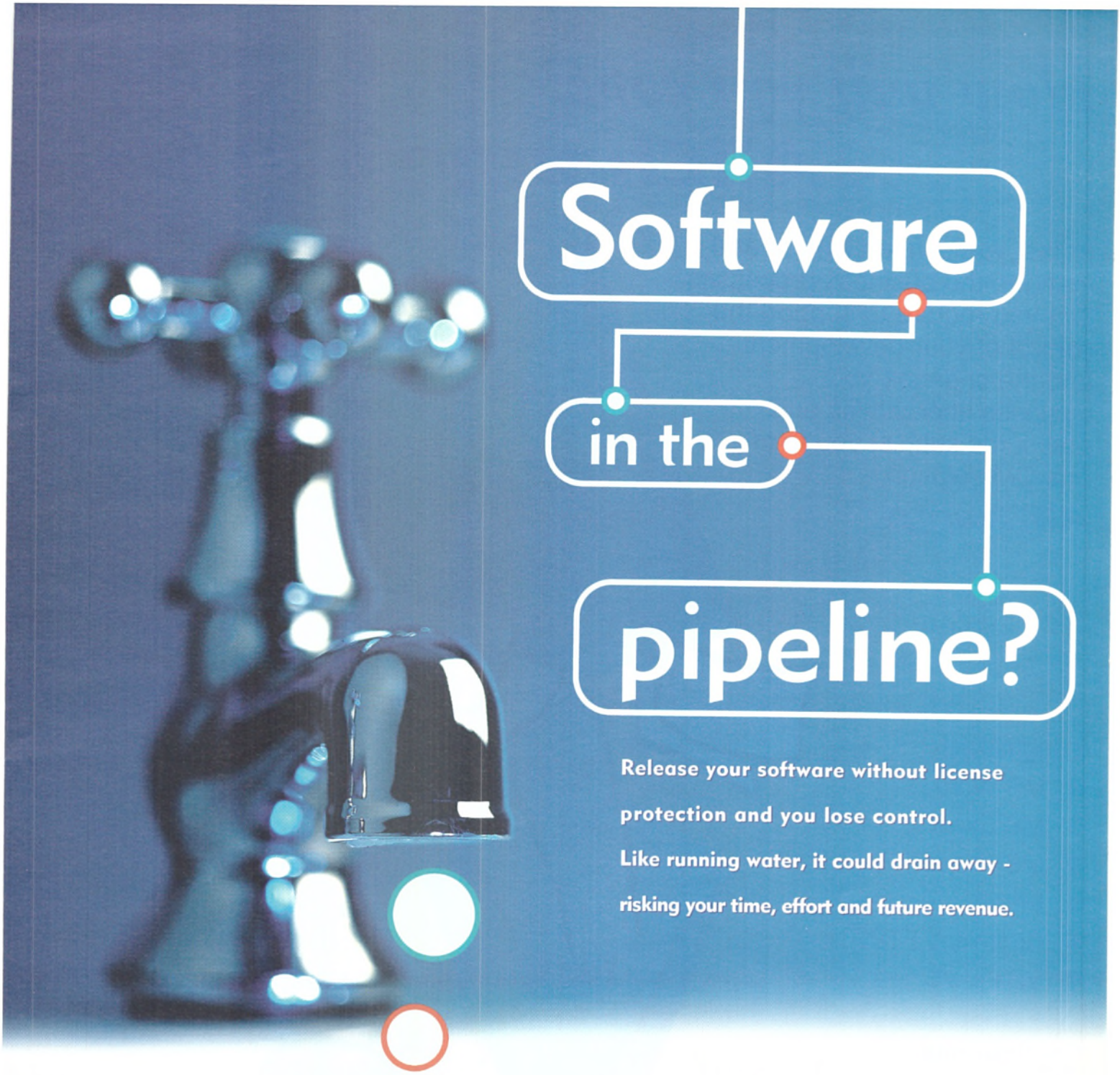

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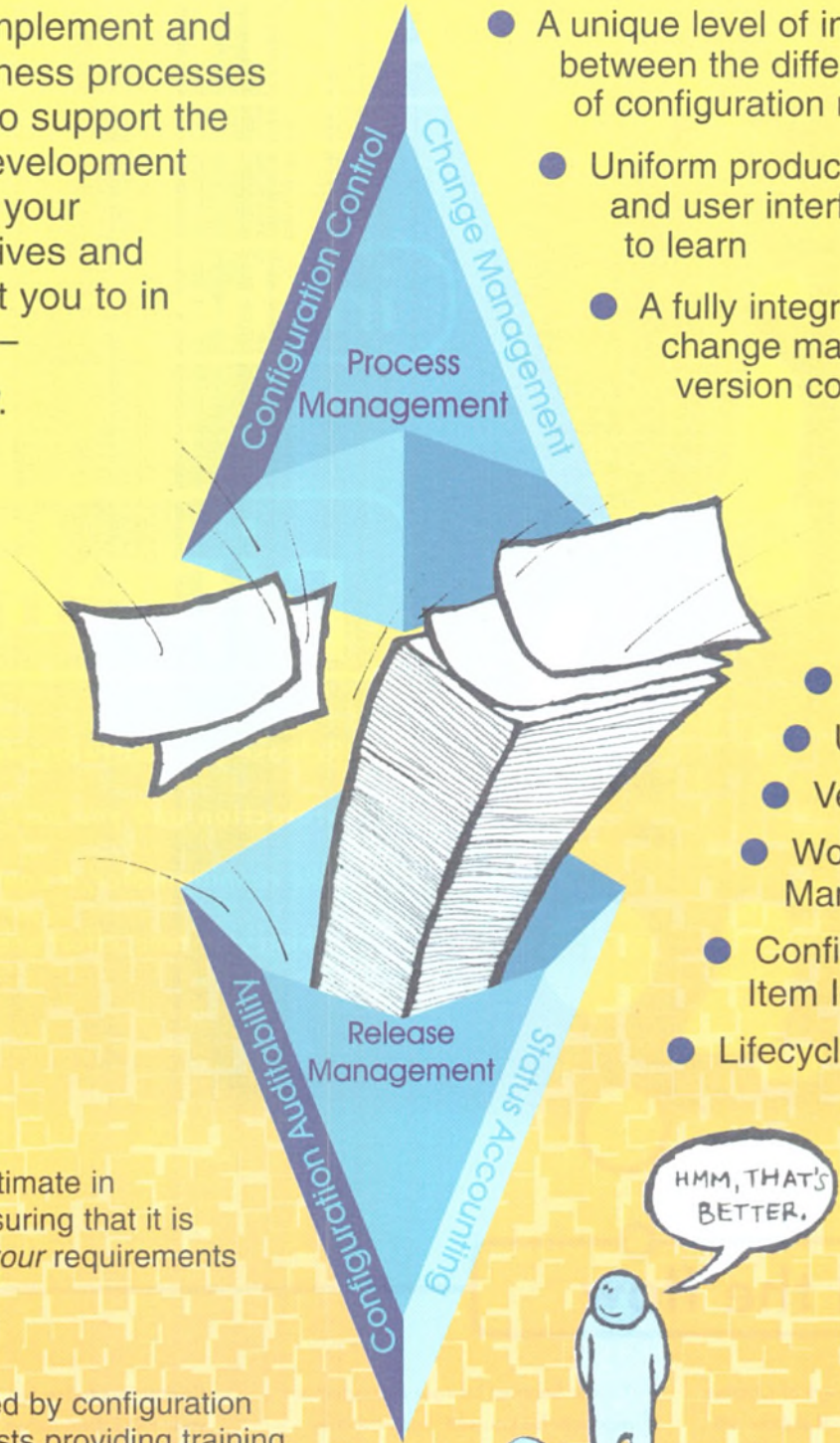

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Enquiry No. De25

The art of errors

Peter Collinson asks a simple question: when we write programs why do we check return values from routines for errors?

I've been hacking a lot of Perl recently. In fact, I haven't written a program in a compiled language for some time. To be honest, I *treat* Perl like a compiled language; I invariably go through what amounts to a compilation sequence while I am creating programs. I make a change to the source (the edit phase), pass the program through Perl with its checking flags set (the compile phase), and finally execute the program (the run phase).

I suppose that I don't subscribe to what the Edit-and-Go evangelists say about Perl. It's just too easy to misplace a bracket or a quote (and there are lots and lots of different flavours of those) and have the whole Perl parser give up on you. Perl's diagnostics are absolutely dreadful when you make a formatting error. I know that picking up where the bracket should match is hard, but it should be possible to do better than Perl does now, which is pretty nearly just to announce the error and hope that you can find it. It's no fun using binary chop techniques to split programs into commented out chunks hoping to get a clue where the problem lies (and this is precisely the technique that I've often resorted to). My rule now is to make a small change and check the program. Of course, such rules are made to be broken.

It's also interesting that, when using a scripting language, it's common to fall into the trap of writing code that doesn't check return values. There's a kind of unwritten rule: the amount of error checking placed in a program is inversely proportional to the power of the language primitives – I am trying to express something about the 'high-levelness' of the language. What's odd about this rule is that the same errors will occur with the program, whatever the language that it's written in. And choosing Perl and C in this context is interesting because both languages provide nearly identical return value capabilities at what might be called 'the system level', when you are using standard libraries and functions.

The system level

When we write programs why do we check return values from routines for errors? This sounds like a dumb question, I guess. The truth is that we are all conventionally inconsistent about which return values we check, and I suspect that we are lead by other people's code as much as anything else.

There are classes of functions that are obvious candidates for checking. The first set of these deals with the outside world. If we are opening a file, then we know that it might not be there, or may not have the correct access permission to allow us to open it, or there may be other reasons why the open will fail. If we are making a network connection, then we expect and program for unreliability. The network may be down at the local end, or at the remote end, or the service that we are looking for may not be supported on the target machine (again, there are other possible problems here too). When we are opening things or starting things, we expect failure.

What about later on in our program? Well, if we are reading data, then we are checking for return values, mostly to find out if the data source is exhausted rather than because the read may fail for other reasons. When we are writing data, returned values from the write calls are rarely checked and we almost never check whether the close call succeeds or fails.

We don't check for errors as we proceed because we mostly have a disk file model for writing data, and our model says that disks are attached to the machine and don't go away. Unix needs a mount command to attach the disk contents to the file system, so the human operator has to announce the attachment and detachment of removable disks, and cannot unmount a file system if it's busy. The mounting and unmounting of disks retains the illusion of permanent connection for the application programs. MS-DOS and Windows don't have the mount model, but certainly Windows 95 tracks the presence or absence of removable media, on occasions, insisting that you replace that disk or CD you have just taken out of the drive. Raw MS-DOS just did not cache data: as long as the light on the drive wasn't flashing it was safe to remove the disk.

Our model says that writes to disks always succeed. Well, they don't. When disks fill up to overflowing, writes must fail. However, we bank on having free space on the disk: our model assumes that disks have infinite free space. The infinitely-sized, fully-connected disk model worked fine until we got networking, and then networked file systems. Suddenly disks could go away.

As Sun developed NFS, it had to cope with the fact that the server could suddenly disappear from the network leaving clients writing to thin air using programs that contained no detection of write failure. The early idea that you could pause the client program indefi-

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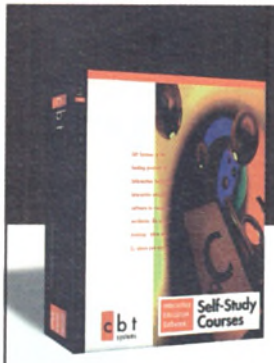

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nitely in the write system call seemed a reasonable thought. When the server arose phoenix-like from its flames, then the client could continue where it left off, and no data would be lost.

However, for various reasons pausing indefinitely in the write call often turned out to be inconvenient, mostly because the user driving the client program would get bored and hit Ctrl-C to kill the program. Incidentally, the human would then be taking the responsibility for the data loss that this action incurs. Actually, for various technical reasons, hitting Ctrl-C wouldn't kill the offending process in the early systems: a machine reboot was needed, and this was mostly inconvenient. On the whole, we've always tried to keep Unix systems running, since there are often several users on them.

Anyway, we check returns from system calls when we open files or networking connections. We don't generally check on the success of a write system call, and perhaps this makes sense. In a system that caches data, where the system will return control to a program before the data actually hits the disk, the kernel has actually no easy way of returning an error on one particular part of the written data. Once it has taken the data from the process it must look after it because the user assumes that it's safe. Maybe checking on writes is less reliable than we might think and *not* doing a check makes sense. We almost never check on the close system call, and actually this is an omission. This is the point where we could tell the user that the data that they have written is not safe.

Self preservation

We check some things because we wish to defend our program against unexpected crashes, and print an error message as we begin to close down gracefully. A good example here is the `malloc` routine that grabs memory from the heap. It returns zero if it can get no space, and if we don't check the return value then we are suddenly dealing with a zero pointer, which is bad news on most machines, causing the hardware to bomb the program out.

The early Unix programs were considerably limited by memory, and as a result contained many statically allocated arrays and a few calls to the `malloc` routine to allocate the odd buffer or two. If you kept calling `malloc` you could quickly exhaust the memory limit imposed on the process. At that time there was no paging, and programs were either completely in memory and runnable, or swapped out. I think that similar limits applied in the early MS-DOS and Windows worlds. Although, the memory models imposed by the machine architecture tended to cause different problems.

Then came 32-bit architectures and virtual memory. Suddenly checking that `malloc` succeeds seemed to be of less importance, and there are undoubtedly many programs out there in user land whose programmers decided that it was a waste of time to do so. These programmers judged that absence of memory was now a 'never happen' error, since memory was now effectively infinite.

However, I reckon that this is poor judgement because programs *can* still run out of memory. Most systems have a limit on the total amount of virtual memory that can be supported. One day, this space will be exhausted and even though there is address space to support a memory request, there is no paging space available to cope with the physical requirement. The system needs to refuse the request.

It's actually a good idea to ensure that there is more than sufficient paging space on any machine, otherwise funny things happen. It has also become slightly more complicated because these days, on many Unix systems, temporary files are stored in what's effectively a RAM disk that lives in the paging area of the machine. Very odd things can happen when programs that are used to being able to open temporary files begin to get strange failures.

If you are still routinely checking that `malloc` succeeds, then you are engaged in some defensive programming, albeit against something that happens very rarely.

Finally, there are a bunch of routines whose returned values are almost never checked, even though error returns are provided. Mostly, these are system calls that interface directly with the memory of the operating system, such as getting the current process ID, or setting some value into the terminal interface.

The programming picture is patchy. Conventional programming practice checks some error returns, mostly for defensive programming reasons, but probably ignores many other errors causing occasional failures when unusual conditions occur. Most of the time, most programs work mostly as expected. What's interesting, perhaps, is that when we move out of the compiled programming environment and begin to look at scripting languages that contain high-level constructs, we'll find that many people's scripts are free from much defensive programming and can often create havoc on a system.

In the beginning...

Beginnings vary. I suppose that the earliest scripting language with which I had serious dealings was the Unix shell. I'm discounting Basic, Logo, Forth, and Focal because all of these were really interpreted languages that were designed to be cheap and easy to run on a variety of machines.

Unix had sprung from the heritage of several earlier systems and inherited many intrinsic aspects of what was then operating system design. For example, each process on a Unix system is provided with three standard I/O channels: the familiar standard in, out, and error channels. You now take this for granted (or you may not), but at the time, the notion of separating runtime error reporting from the 'real' output of the program wasn't too common.

Of course, the default situation is for the two output channels to point at the same device: the user's terminal. When the user types a command, the output from the program can be intermixed with error mes-

sages. Sometimes, this is precisely what we want. However, the shell permits the user to redirect standard output to a file, so that the error messages become evident on their screen or can be captured in another file. Even the earliest shells had file redirection abilities permitting you to redirect one or both of the output channels, pointing them separately or together at files. Actually, the Bourne shell complicated matters quite a bit, and the syntax for redirection has always been confusing and is hard to get right. The C-shell retains the earlier, more comprehensible, but less flexible syntax.

Separating errors and data into two streams has a profound effect on the ability to use programs as 'subroutines' in the scripting language that we call the Unix shell. It became possible, and desirable, to write command pipelines, moving data from the standard output of one program to the standard input of another. However, errors from the programs in the pipeline would still be visible to the user. They could see why the pipeline failed because the error appeared on the standard error channel pointing at their terminal. This means an error message from the third program in the pipeline was not eaten by the fourth program, and appeared on the user's screen telling them what was wrong.

The Bourne shell had a profound effect on what we expected from scripting languages. Up to that point, shell scripts had been seen as simply a method of collecting several commands into a file to be executed. A batch file, if you like. The Bourne shell added real programming syntax and the ability to control commands and their arguments. Steve Bourne also managed to persuade the people in Bell Labs who worked on Unix Version 7 that each command should return a success or failure value. His shell could use these values to decide whether a command had run to completion, and suddenly the idea that commands were subroutines to the shell was more viable. You could get out of a script when something had failed, rather than rattling on, possibly doing great damage.

Armed with the Bourne shell and the collection of Unix commands that were tools, it is possible to write very complex scripts. Scripts could do real work and be handed to other users, as if they were regular commands, so the user doesn't often know whether they are dealing with a script or a compiled program. There are some problems with the approach.

First, error messages from the command will often come from the individual commands that are the subroutines forming part of the script. It can be more than confusing to have a command called `lpsub`, for example, suddenly say:

```
mv: cannot access kk
```

Actually, this error message is a product of bad coding. It is certainly possible to code the script such that this message is not shown to the user and the knowledge that the move command failed is used to trigger a sensible error message to the user.

Second, the error messages that emanate from Unix commands are generally terse, and some would say, incomprehensible. The terseness was intentional at the time that the system was created. When you are using a device that prints on paper at 110 baud, you don't want much extraneous information to be sent to you.

However, the terseness has continued. Programmers have often contented themselves with the standard system error messages that give a general failure reason rather than thinking about informing the user of what the error means in the context of the application. I suppose that general text is better than the message that says 'Error message: 110', which is of no use to anyone. Actually incomplete error reporting is not just a Unix fault; it permeates all programming on all systems.

Telling the user

I suppose one reason for not checking for a failure condition is the sinking feeling that you get when you realise that you are going to have to build an error message delivery system that may never be used in the foreseeable lifetime of the program.

The command line-based Unix system had it easy. All you had to do was write a message to the standard error channel and you were done. On a windowing system like X11 or Windows, you'll have to generate a dialogue box to keep the user informed. This is easy: there are programming hooks for such activities. However, it will involve the user in some interaction, if only to make the dialogue box go away when the message is read, and this interaction may not be desirable.

Being forced to generate an error message delivery system seems to happen a lot when you are writing scripts for the Web. You've just got the user through a series of forms and come to write the data, when suddenly you can't write the information to disk. There's certainly a temptation to smile sweetly saying 'thanks for your order', while you quietly drop it on the ground. But doing this doesn't help the customer. You are forced to implement some error mechanism or other. I seem to have a standard page that says 'If you are seeing this page then something is wrong. It's a *should never happen* situation. Please mail to *webmaster@whereever* and tell them – this message'. The message can then be diagnostic and helpful to you, because the user is going to send it to you and doesn't really have to understand it. And it's possible to log such errors and examine the log regularly.

A trade-off

Well, I seem to have come to no firm conclusion. I suspect that error management is a topic that you rarely think about, and if I've managed to make you do that, then this article is a success. Error management is obviously a trade-off between what makes sense and what is needed to protect the code from unwanted crashes. However, programs always have a longer life than we think that they will, and we are also investing in the future. We are told that there will be a demise of computing as we know it on 1 January 2000. We need to learn from that – and plan for 2038 – when we run out of 31-bit time. ■

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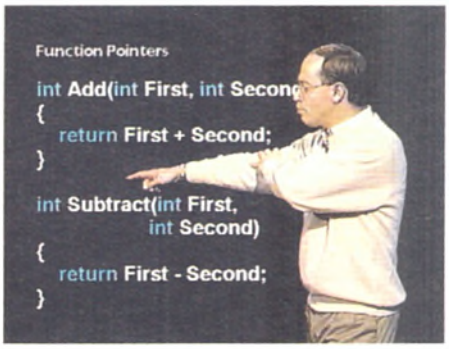

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Francis Glassborow warns that the current C++ definition of default-initialisation requires programmers to be aware of implementation details in other people's code.

The danger of default-initialisation

Several months ago I was dabbling with a debugger and looking at the results of compiling some simple C++ when I realised that the only explanation for what I was seeing was that the compiler had not initialised a data structure. At first sight the compiler's behaviour seemed rational so I was lazy and did not check the C++ Final Draft International Standard. Instead I wrote up the code as a problem. The answer was to have been published last month. As a result of a discussion of the problem at the recent meeting of the C++ Standards committees I am now better informed and can write about a real problem hiding behind mine.

Initialisation

C++ has a concept of a POD (plain old data-type). The main characteristic of a POD is that its behaviour and data layout will be exactly that which you would expect from a traditional C `struct`. This means that the constructors for the object and all the member objects must be compiler-generated. This rule must be applied recursively to the member objects.

In C, objects of a `struct` type are zero-initialised, brace-initialised, or uninitialised. Zero-initialised means that each member is zero-initialised. Built-in types and pointers are zero-initialised by treating them as if the programmer had assigned a zero to them. The C rules state that all objects of static storage duration are zero-initialised unless they have been brace-initialised. There are some further restrictions to brace-initialisation of globals. C also zero-initialises any items left uninitialised by a brace-initialisation. For example:

```
int main (){
   int numbers[10] = {1};
   /* other code */
   return 0;
}
```

That results in the first element of `numbers` being set to one and the nine remaining elements being set to zero. Remember that we have some special syntax for strings in C that hides the braces in a brace-initialisation:

```
int main(){
   char * strings [10] = List;
   /* other code */
   return 0;
}
```

That results in `strings[0]` pointing to the string literal `List` and the other nine entries becoming `NULL` pointers. If you ever see something like that in real code, suspect the programmer's sanity because the first item is semantically read-only, while the rest need not be. You should feel far more comfortable with `char const * strings[10] = List`, which has the merit of providing an array of pointers to read-only strings.

The original C++ rules were intended to provide the same behaviour as C for code that could be shared between the languages. Unfortunately, there were persuasive reasons to revisit this issue several times.

Default-initialisation

One problem is that C++ does dynamic allocation with `new`. In C we can zero memory (or set it to any other value we wish) by using `calloc()` instead of `malloc()` to do memory allocation. In C++ it seemed desirable to allow programmers to choose between using a default constructor (which does nothing for a POD) and something akin to zero-initialising. This was implemented by a syntactic device. The following trivial example should illustrate this:

```
int * uninit = new int; // *uninit is uninitialised
int * zeroed = new int(); // *zeroed is zero
```

That pair of parentheses in the second case results in a call of a user-provided constructor if one is available, or default-initialisation if there isn't one. Note that term: 'default-initialisation' (not 'calling the default-constructor' nor 'zero-initialisation'). Originally, default-initialisation was defined as to zero-initialise everything that was not initialised by a user-provided constructor. If an object did not have an overall user-provided default constructor, then its members would be default-initialised. At every level, if there's a user-provided default constructor it was called, otherwise default-initialisation happened. Default-initialisation of built-in types or pointers was provided by zero-initialisation. This meant that default-initialisation of PODs was zero-initialisation, and default-initialisation of other types was a combination of zero-initialisation and calls to user-written constructors.

Note that this form of default-initialisation works fine with my problem code. Container templates copy a default-initialised instance in order to provide the specified initial container. Consider:

```
struct Problem {
   char * message;
   string report;
};
vector<Problem> messageList(10);
```

That works fine with the above definition of default-initialisation. The compiler generates code to create a default-initialised temporary instance of `Problem` and then copies it ten times to create `messageList`. In the temporary, `message` will be a null pointer and `report` will be a null `string`. Both of these can be safely copied.

However, the C++ Standards committees revisited the concept of default-initialisation and redefined it as zero-initialisation for objects with trivial default constructors (effectively built-in types, pointers, and PODs) and calling the compiler-generated default constructor for all other complete objects where there was no user-provided default constructor. This is not the same thing. The `struct Problem` has a non-trivial default constructor because the compiler-generated default constructor must call the constructor for `string`. However, the compiler-generated default constructor does not zero-initialise `message`.

Note how this damages your previously safe code. Creating `messageList` will now involve copying an uninitialised pointer ten times. Of course you might blame the designer of `Problem` but how fair is that?

Consider:

```
struct NewProblem {
 double x;
 char * message;
};
NewProblem * np = new NewProblem();
```

As the author of the last line you know that your code is safe because both `x` and `message` will be zero-initialised even by the latest rules. However, your safe code breaks when the author of `NewProblem` decides to refine the code by replacing `char *` by `string`. Worse still, this small change could be many layers deep in some member of a member of... The current definition of default-initialisation requires programmers to be aware of implementation details in other people's code. That must be wrong. The definition of default-initialisation will be fixed in the first Technical Corrigendum that will be published in a few years. Meanwhile, check your compiler (most of them do not even do the right thing for PODs) and be careful of using collections of objects that rely on compiler generated default constructors.

In the above discussion I have used `struct` because I did not want to add further complications by introducing access considerations. Some readers may raise questions about having pointers in `struct/class` objects that do not have user-defined constructors. While I generally agree, readers should note that there are at least two reasons for using a pointer in a class type. You may want to attach a dynamic sub-object (the class instance 'owns' the resource) or you may want a rebindable reference to an external object (the class instance does not own the object). In both cases I would strongly advocate defining a default constructor, but the latter case does not need a user-written copy constructor, copy assignment, or destructor. There are good reasons for not providing these if they are not needed. That is another story.

Static and multi-threading

Every time I suggest the use of `static` variables in my code I get an email from Kevlin Henney reminding me that `static` should be outlawed because it does not mix with multi-threading. Of course he is right. As more and more of us move into coding in multi-threaded contexts it becomes ever more necessary to avoid coding habits that break in such circumstances. I wonder what other bad habits (or at least non-portable idioms) readers are aware of. Time for some sharing.

Last month's problem

Programmers are very good at picking up idioms without always understanding what they are designed for. What is wrong with the following?

```
#include <stdio.h>
#define length(array) (sizeof(array)/sizeof(array[0]))
int main(void){
   char * buffer = "This is some space for input data…";
   fgets(buffer, length(buffer), stdin);
   /* more code */
   puts("Have a nice day!");
}
```

Let me start with the last mistake. There is no return statement. This is only an error in C because C++ provides an explicit exemption for `main()` by defining that 'falling off the end of `main`' without a return is equivalent to '`return 0`'. The compiler has to fix things up some way because your program returns to the operating system via a call to `exit()`, passing it the return value from `main()`.

The first serious error is in using a string literal in a context where you clearly intend to write to it. While C considers the type of a string literal to be array of `char` (C++ now types it as an array of `const char`) it adds a semantic constraint that makes any attempt to write to the storage undefined behaviour. In other words, the attempt to pass `buffer` as the first argument to `fgets()` results in undefined behaviour.

Next, look at the second argument passed to `fgets()`. When the compiler sees it, it will be equivalent to `sizeof(char *)/sizeof(char)`. The problem with this overly popular macro is that it works only for a static array. However, `buffer` is not the name of an array but of a pointer to `char`.

Assuming that `sizeof(char *)` is 4 you might even get away with this code though it would nibble your input away very slowly. There are circumstances where `length` will return values as small as zero.

When you use the syntax that makes the compiler provide an appropriate array size for an array you may want to automatically compute the number of elements. For example:

```
int main(){
   int some_primes[]={2,3,5,7,11,13};
   size_t count = sizeof(some_primes)/sizeof(some_primes[0]);
   /* other code */
}
```

I have retained the use of `some_primes[0]` because that protects against changes in the type of `some_primes` (for example, to an array of `short`). My guideline is to restrict use of the idiom to the immediate vicinity of an array that has been declared via brace initialisation.

C++ programmers have their own 'clever' solution. Someone invented the following template:

```
template <typename T, size_t N>
char ( &sizer( T (&array)[N] ) )[N]; // not defined
```

This declares a function `sizer()` that returns a reference to an array of `char`, and takes a reference to an array of `T`, each of `N` elements. When `sizeof` is applied to its return value it yields `N` at compile time. No definition of `sizer` is needed, because it's never called.

It is a matter of taste, but I do not like this kind of code. It relies on a kind of cleverness that makes its author feel good but bewilders those maintaining code that uses it.

This month's problem

Each issue of *C++ Report* ends with a problem that is so obscure that I doubt that many even read it. I have always tried to keep my problems simpler in the hope that many readers could tackle them successfully. My recent experiences suggest that I am mistaken. I find that worrying. However, here is another one to baffle and bewilder.

C9X is going to allow C++ style late declarations of variables in `for` statements. The problem is that, as in C++, you must either declare and initialise a single new variable or initialise a list of variables. Some ingenious programmer suggested the following:

```
int i;
// code
for (char * ptr = (i=4, 0); i <10; i++) {
   // code
   }
```

as a way of declaring `ptr` and initialising it as a null pointer, as well as initialising `i` to 4. What is wrong with the idea?

There will be a small prize for a randomly selected correct answer. I will make the selection on Christmas Day so you have plenty of time. ■

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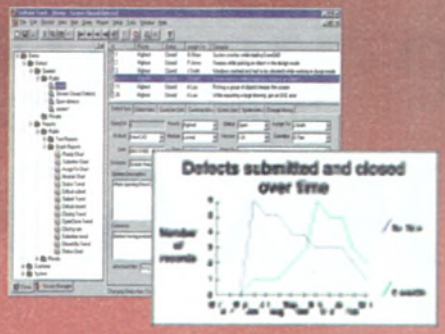

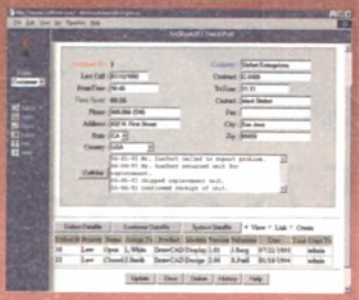

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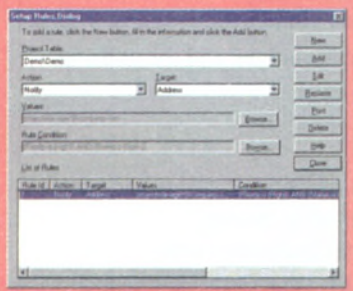

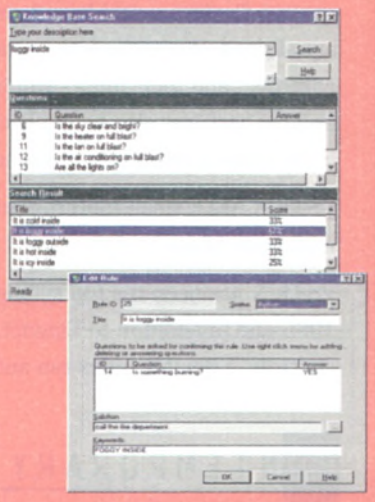

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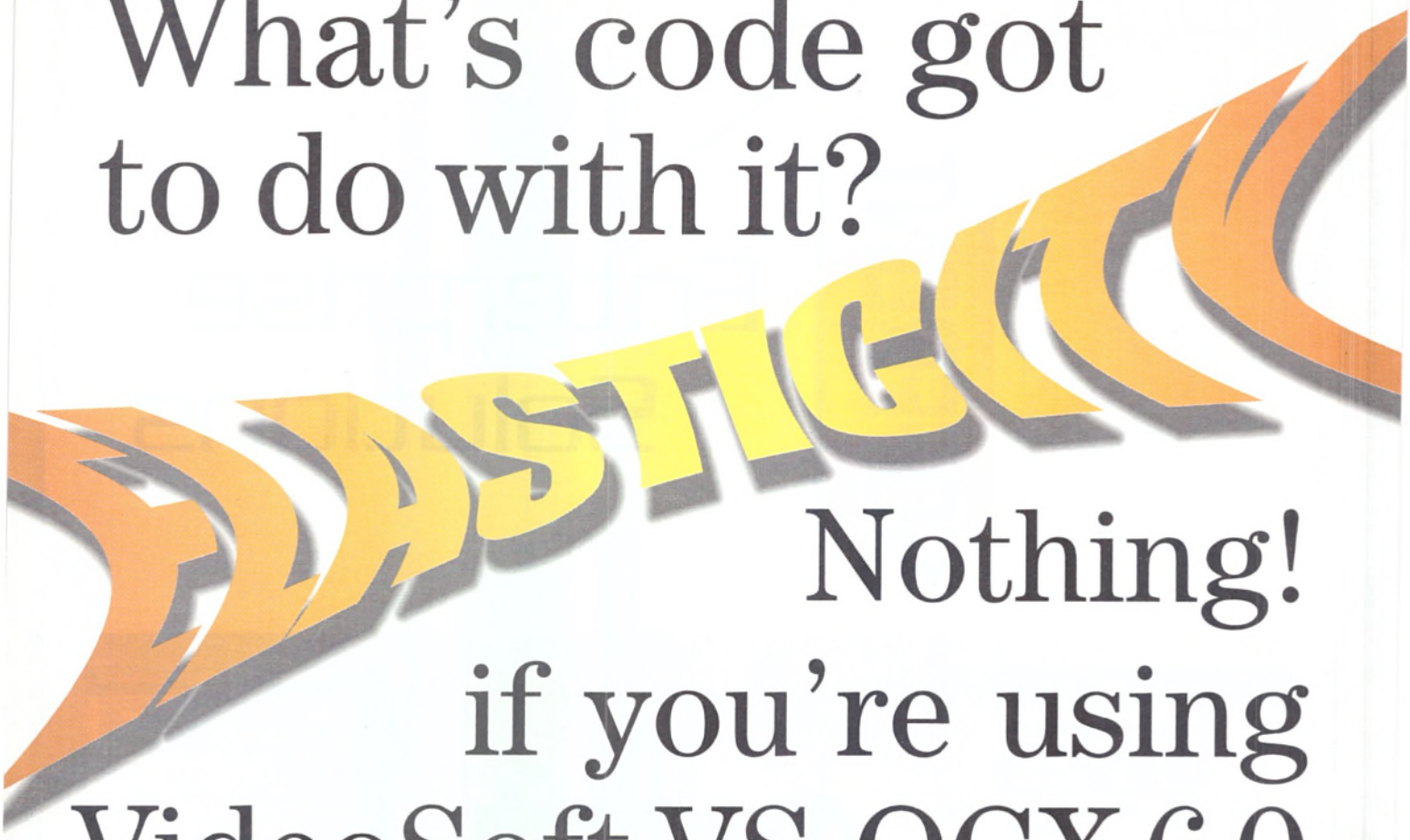

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Enquiry No. De30

Programming with interfaces

Mark Smith looks at two design patterns – Visitor and Singleton – that lend themselves to be represented as interfaces.

In the past few articles, I have touched on the concept of interfaces in Delphi, usually as a mechanism for implementing a design pattern. This month I want to talk about interfaces in more depth. Borland added interfaces to Delphi 3 to make it easier to work with COM, and most of the Delphi literature talks about interfaces only in connection with COM. This is a pity, as they have a lot to offer generally. Delphi 4 introduced some additional features, which I think make interfaces even more useful.

When starting to design an application, it is often helpful to think about the objects and classes required, concentrating only on the abstract features of the classes – their properties and methods – without regard to how you are going to implement them. You might say 'I want a class that acts like this', rather than 'I need a class descended from such-and-such'. This is designing with abstract data types – abstract because you are not paying any regard to implementation, and in effect you are saying what the interfaces (properties and methods) of your classes are. The conceptual view of a system is usually the clearest, since it does not have any messy implementation details. You add inheritance later as you move from conceptual to physical design, though the closer you can stay to your conceptual model, the better.

Inheritance is one of the cornerstones of object-oriented design, and plays a key role in defining what properties and methods a class has. Normally, you think of inheritance as defining an 'is a kind of' relationship between classes. For example, a `TDataSet` is a kind of `TComponent`, which in turn is a kind of `TPersistent`. In Object Pascal, inheritance usually means *implementation* inheritance – if you are a descendent of a class, you do not need to re-implement the properties and methods of your ancestors, since you inherit their implementations. The Delphi VCL is a classic example of implementation inheritance. All classes descend from a single ancestor, `TObject`, and each descendent class adds more and more functionality. It is hard to come up with an example of a real Delphi program that does not make use of implementation inheritance.

There is another common way of doing inheritance, where you inherit only the interface of a class. Not surprisingly, this is called *interface* inheritance, and this is the model supported by Visual Basic. If you only inherit an interface with no implementation code, you need to re-implement all of the ancestors methods yourself. Usually, VB programmers do this by having a private instance of the ancestor class and delegating all calls to that. I find it useful to think of the relationship here as being that the descendent 'acts like' the ancestor.

Why interfaces are important

Interfaces can help with conceptual modelling. If you use interfaces to build the abstract classes identified during conceptual modelling, you can build your application in terms of those interfaces. This keeps your application very close to your conceptual model. Looking at it another way, you can design your conceptual model using interfaces, and then build your application using these interfaces, while the physical model is the classes that support those interfaces. Which way you approach it is up to you. The crucial feature of an interface is that it is abstract – the code to implement the interface is written in a class that supports that interface.

The second and more common reason for considering interfaces is for their ability to provide a safe form of multiple inheritance. Since a class that implements an interface has an 'acts like' relationship to the abstract class defined by the interface, it can be used as if it inherited directly from a given interface. Since a class can implement many different interfaces, a given object can act like many different abstract classes.

A third use of interfaces relates to the fact that they hide the object they are attached to. Since an interface has no constructor or destructor, a programmer can never instantiate the object that supports the interface directly, provided you do not expose the object itself.

Programming with interfaces

Interface declarations are very similar to class declarations, but use the keyword `interface` rather than `class`. You then list the methods of the interface. Everything in an interface is assumed to be public, and no directives such as `virtual` or `dynamic` are supported. Note that the only way of declaring properties on interfaces is in terms of get/set methods. See Listing 1 for an example. You can specify an ancestor interface, though if you do not, then your interface will be a descendent of `IUnkown`, which is the ultimate ancestor for all interfaces. This idea of interfaces inheriting their properties and methods from other interfaces seems odd at first, though it can be useful, as I will show.

It almost always makes sense to implement interfaces on a class descended from `TInterfacedObject`, which supports the methods declared in the `IUnkown` interface. If you want the object to appear on a form, you can descend from `TComponent`, which also implements `IUnkown`. If you need to keep a reference to lots of interfaces, use `TInterfaceList`.

This month I'm going to look at two design patterns that lend themselves to be represented as interfaces, though the emphasis is on Object Pascal rather than the patterns themselves. Visitor and Singleton – from *Design Patterns* by Gamma, Helm, Johnson, and Vlissides – are two patterns that I make use of more and more in Delphi. The Visitor design pattern describes a basic operation to be performed on the elements of an object structure, letting you add new operations without making changes to the object structure itself. A common use of Visitor is in collecting summary information from a

```
type
  ISingleton = interface
    function GetUsageCount : integer;
    property UsageCount :
                integer read GetUsageCount;
  end;

IExpensiveResource = interface (ISingleton)
    procedure DoStuff;
```

Listing 1 – Singleton interface declarations.

Aggregation has a lot to offer as it means you can write code to support the interface only once.

number of classes that form a tree or other hierarchical structure, where you do not want to add the summarisation to the tree classes. By using the visitor pattern, you prevent classes from becoming cluttered with summarisation operations, and you can add new summaries without needing to change your exiting classes.

The Visitor pattern is declared as a pair of interfaces as shown in Listing 2. The `IVisitable` and `IVisitor` interfaces are used as follows. A class that accepts visitors implements the `IVisitable` interface. A class that visits other classes implements the `IVisitor` interface. When a visitor calls the `Accept` method on a visitable object, that object can pretty much do what it likes with it. If the visitable object is a node in a tree, it can call the `IVisitable` interfaces on all of its subnodes that support the interface.

In the example program, we have a class `TBudget` that is visitable, and a pair of visitor classes, `TBudgetCostSummarise` and `TBudgetPlotSummarise` that know how to visit and build financial and plot summaries for a budget. When a 'budget' accepts a visitor, it checks to see if it is a budget visitor, which has a `Visit` method that takes the concrete `TBudget` class. If so, it passes itself back – giving the visitor the actual budget object rather than an interface. The benefit here is that the budget class is not cluttered with summarisation functions, and other summaries can be added very easily. The visited object can then send the visitor on to its subnodes, thus traversing the tree.

The Singleton pattern ensures a class has only one instance, and provides a global point of access to it. I have not found a way of using the implementation exactly as presented in the book, so the solution here obeys the spirit of the pattern rather than following the letter. The Singleton interface is a marker for more useful interfaces, but helps make it clear that a descendent interface has a special use. The `UsageCount` property reports how many references there are to the underlying object. In this implementation, `UsageCount` should not drop to zero before the application closes.

Module `ExpensiveResource.pas` contains code that implements the Singleton pattern, using the `GetExpensiveResource` function as a single point of access to the implementation. Since the underlying implementation is private, there is no way to create another instance of the protected element. As you can see from looking at `TExpensiveResource`, it is very easy to implement an interface, and here I use the most straightforward though least reusable way to do so – direct implementation. All the methods on all the supported interfaces are declared, including those for indirect ancestor interfaces like `ISingleton`.

```
type
  IVisitor = interface
    procedure Visit (Visitable : IVisitable);
  end;

  IVisitable = interface
    procedure Accept (Visitor : IVisitor);
```

Listing 2 – Visitor pattern interfaces declaration.

You can declare a variable of type `IExpensiveResource` and pass it an instance of the `TExpensiveResource` class, since `TExpensiveResource` contains `IExpensiveResource` in its class declaration. Note that while `TExpensiveResource` implements all of the methods of `ISingleton`, it is not type-compatible with that class, since it does not have `ISingleton` in its class declaration. However, the `ISingleton` and `IExpensiveResource` interfaces *are* compatible because `IExpensiveResource` is a descendent of `ISingleton`. You can assign an `IExpensiveResource` variable to an `ISingleton` in the same way as you can assign a `TPanel` to a `TWincontrol`. See `TForm1.SingletonClick` for examples of calling `GetExpensiveResource` and treating the result as both an `IExpensiveResource` and an `ISingleton`.

Reference counting

One neat feature of programming with interfaces is the way that Delphi automatically deletes interfaced objects when they are no longer referred to if they descend from `TInterfacedObject`. It accomplishes this through maintaining a reference count of the number of variables that refer to an interface. When the reference count reaches zero, the object is destroyed. Objects that descend from `TComponent` are not deleted until their owner is deleted.

Aggregation using the implements keyword

The `TExpensiveResource` implements the methods of `ISingleton` and `IExpensiveResource` directly, but that is not the only way to do it in Delphi 4, where you can delegate interface functions to another object. This other object provides sensible default behaviour for the interface and is aggregated within the object that supports the interface. Aggregation has a lot to offer as it means you can write code to support the interface only once. Since there is only one implementation of the interface methods, you need to do a lot less work if you decide to change the interface. All classes that support an interface through aggregation are automatically updated to support the changes once you have rebuilt the aggregate, thus preserving the integrity of your application. The revised Observer pattern code from the EXE OnLine website illustrates the `implements` style, containing numerous implementations of the Observer pattern.

Why use a GUID?

You may have noticed that I have added a GUID to the interface declarations in the sample application. While GUIDs are not required for programming interfaces in Delphi, they are crucial if you want to dynamically cast a class to an interface, or to try and locate other interfaces on the object implementing the interface you already have. Using the `as` operator on an interface without a GUID results in a compilation error. This is one area where the Delphi implementation of interfaces seems a little idiosyncratic, exposing the tight binding between interfaces and COM. Creating a GUID in the Delphi code editor is very simple: just create an empty line and press Ctrl+Shift+G.

Finally, a note of caution: if you find that you are getting a lot of runtime errors when programming with interfaces, check to make sure you are only ever referring to the interface and not the implementation objects. This month's demonstration program, `InterfaceDemo` can be downloaded from EXE OnLine. ■

Mark Smith is a contractor specialising in Delphi. You can contact him at msmitha@cix.co.uk or say hello at a Borland Users Group meeting. Call 01980 630032 for details. The code for this article is available on EXE OnLine and via ftp at ftp://ftp.exe.co.uk/pub/exestuff/9812_delphi.

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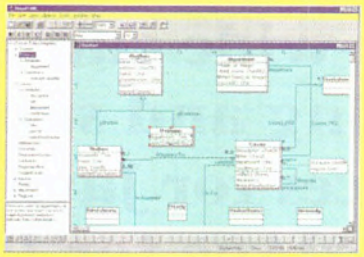

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The day of the Jacl

Tom Guinther shows how Tcl can be integrated as an application's macro language, providing an extensible model for the creative end-user.

In last month's column I introduced the topic of Tcl (pronounced 'Tickle'), a scripting language that has gained quite a lot of respect and popularity in the Unix world. It is also used extensively in the back rooms of the Internet development community, where scripting languages are the glue that hold the pages of the World Wide Web in place.

My introduction to programming in Tcl was a C-based Unix application for statistical modelling. At first, I was reluctant to use the application because I had to port it to the Win32 environment, and also because I had to make the effort to learn Tcl. I overcame my reluctance when I realised that no other program could offer its features and flexibility in one package (unless I wrote it myself). Without much of a fanfare I downloaded the modelling package, the latest version of Tcl (8.0.3), and much to my surprise I had everything working in about 15 minutes. I spent another 15 minutes looking at examples, and learning about the Tcl language structure. When I was done I could create powerful models with ease, something I could never have achieved with any of the competing products.

What I took away from this experience reinforced something that I have always known. Applications that provide an extensible model through scripting (or other means) transfer the power of the developer's creation into the creative, problem solving hands of the end user. Ultimately, this creates a very rewarding relationship for everyone but your competition.

Being a relative late-comer to the Tcl scene I was pleasantly surprised to see that Tcl was available for the Java platform in two distinct forms. The first form, TclBlend, bridges the Java environment with the existing C implementation of Tcl. TclBlend provides a set of Java classes in the `tcl.lang` package. This uses JNI to interact with the C base interpreter, and provides extensions that (via the Reflection API) allow you to create and interact with Java objects from Tcl script. The second form is Jacl (Java Application Command Language), a 100% pure Java implementation of the Tcl interpreter and environment. The Jacl interface is, by design, equivalent to the TclBlend interface, but because they have different code bases there are no doubt certain differences.

Using Jacl

Jacl can be used in a variety of contexts. My example will use it as a straight scripting language embedded into a Java application. You can also use Jacl to write Tcl command extensions that can be loaded and invoked from arbitrary Tcl scripts. Another powerful choice is a hybrid application that uses Java as the main framework but implements many of its features using Tcl. This allows the end user to redefine or augment the application's Tcl code with their own. A good example is a GUI button that when clicked executes the Tcl command, `UserButtonClicked`. The user can redefine this Tcl command to perform custom actions, or extend the existing functionality.

To start using Jacl make sure that the `jacl.jar` is on the class path and import the `tcl.lang` package (using `import tcl.lang.*;`). Next, in the body of your application you can create one or more `Interp` objects. Each `Interp` object represents one unique instance of a Tcl Interpreter. You can use the `Interp` object to add and remove commands and variables, and of course to evaluate Tcl scripts. Any command, variable, or state information is specific to this interpreter, so if you go to the trouble of creating a complex Tcl environment, you'll want to keep an extra reference to the `Interp` object so it won't go away unexpectedly. The following Java application executes a Tcl script that the user types on the command line (eg `java TclExec "puts {Hello World!}"`):

```
import tcl.lang.* ;
public class TclExec {
  public static void main(String args[]) {
    try {
      if (args.length == 1) {
        Interp interp = new Interp() ;
        interp.eval(args[0]) ;
        System.out.println(
                interp.getResult().toString()) ;
      } else {
        System.out.println(
                "Usage: TclExec {Tcl script}\n") ;
      }
    } catch(Exception e) { System.out.println(e) ; }
  }
}
```

An interpretation please...

Some of the primary functions for the class `Interp` are `createCommand`, `deleteCommand`, and `getCommand`; `setVar`, `getVar`, and `unsetVar`; `eval`, `evalFile`, `getResult` and `setResult`.

The `createCommand` function allows you to add a command to the Tcl interpreter. A Jacl command is a Java class that implements `interface Command` (more on this later). The `deleteCommand` allows you to remove a command, and `getCommand` returns the class that implements the `Command` interface. This is all very straightforward, but don't forget that `createCommand` overwrites any existing command of the same name. And when I say any command, I really mean *any* command. The very first mistake I made was redefining the `set` command, which turned out to be a bad idea.

The methods `setVar`, `getVar`, and `unsetVar` are also straightforward. The `setVar` method sets the value of a variable and creates it if it doesn't exist, and `getVar` returns the value of a variable or throws a `TclException` if it doesn't exist. The `unsetVar` method allows you to remove a variable from the interpreter, which means that an exception is thrown the next time it is read. If you specify an array element to `unsetVar`, then just the element is removed, otherwise the entire array is deleted.

The `eval` and `evalFile` methods are used to execute scripts. The first takes an object that represents a string (such as `String` or `TclString`) and executes it as script. The second takes the name of a file, opens it, and executes it as script.

The `setResult` method is typically used by a Tcl command to set the result of the command into the interpreter. The interpreter often uses the result as input into a subsequent command. Every command has a

result, but in some cases that result may be empty ({} or ""). The `getResult` method returns the current result value of the interpreter, and is relevant after a script has executed (`eval` or `evalFile`).

Writing a Tcl command using Jacl

A Tcl command is a Java class that implements `interface Command`. This `Command` defines one method: `void cmdProc(Interp interp, TclObject argv[])`, which is called to execute your command when the command needs to be evaluated by the Tcl interpreter. The two arguments to the command are the interpreter for which the command was invoked, and the arguments to the command themselves. One of the primary purposes of the `Interp` argument is to allow you to invoke the `setResult` method, but you'll find a variety of other ways to interact with the Tcl interpreter.

The arguments to a Tcl command are an array of class `TclObject`. This is a special type provided by the `tcl.lang` package and it's used to encapsulate Tcl variables (which are typeless). Each Tcl variable has an efficient internal representation, and a string form. To access the string form of the object use the `TclObject.toString()` method. To access the internal representation use the `getInternalRep()` method. The type of the internal representation can be one of the following: `TclBoolean`, `TclDouble`, `TclIndex`, `TclInteger`, `TclList`, `TclString`, and `Reflectobject`. If you need to insure that an argument is of a specific type, then you have to get the internal representation and compare it to the acceptable types for your command.

The following command always returns the string 'Tcl Rules!':

```
class TclRulesCommand implements Command {
  public void cmdProc(Interp interp, TclObject argv[])
    throws TclException {
    TclObject tclRulesString ;
    if (argv.length != 0) {
      throw new TclNumArgsException(
                interp,1,argv,"Usage: TclRules") ; }
    tclRulesString = TclString.newInstance("Tcl Rules!");
    interp.setResult(tclRulesString) ;
  }
}
```

The JaclApp sample program

I wrote a sample program using Jacl to help me conceptualise how I would design a Tcl interface for a Java application, in this case a debugger. For this application I want Tcl to be an integrated part of the environment so that the user can control various aspects of the user interface (customisation), and eventually write custom debugger commands. In this scenario, Tcl becomes the application's macro language.

```
class SetCommand extends BaseCommand {
  protected Dictionary Properties ;
  public SetCommand(Dictionary properties) {
    super("SetProperty") ;
    Properties = properties ; }
  public void cmdProc(Interp interp, TclObject argv[])
      throws TclException {
    int index ;
    String propertyName = null ;
    TclObject propertyValue = null ;
    BaseProperty baseProperty = null ;
    if (argv.length != 3) {
      throw new TclNumArgsException(interp,1,argv,
                  "SetProperty property value") ; }
    propertyName = argv[1].toString() ;
    propertyValue = argv[2] ;
    if ((baseProperty=(BaseProperty)
        Properties.get(propertyName))!=null) {
      baseProperty.setProperty(interp,propertyValue); }
    else {
      throw new TclException(interp, "Unknown property ("
        + propertyName + ") specified to \""
        + getCommandName() + "\" command") ; }
  }
}
```

Listing 1 – The SetCommand class.

When the application starts up, I want the user to be able to control a variety of options, which I call properties. These properties range from the general, such as Font and Font Size, to the specifics of how the disassembler displays information (Code). Rather than having an individual command for each property I wanted to isolate access of property values into two commands: `GetProperty` and `SetProperty`. Although properties could be thought of as variables, I don't want them to be Tcl variables because I want to control what happens when you get or set a property. If they were variables the Tcl interpreter would simply get or set the current value and we couldn't generate any side-effect events that might be required (such as changing the font).

The first thing I did was to create an interface to describe a property:

```
interface IProperty {
  public String getName() ;
  public void setProperty(Interp interp,
                          TclObject tclObject)
      throws TclException ;
  public TclObject getProperty(Interp interp)
      throws TclException ;
};
```

Second, I wrote the `SetCommand` (see Listing 1) and `GetCommand` (not shown) classes. Each property in the application extends the `BaseProperty` class, which implements interface `IProperty`. The application creates one `Dictionary` that contains the name of the properties, and the class that implements the property functionality. The following is the 'font' property class:

```
class FontNameProperty extends BaseProperty {
  private String FontName ;
  FontNameProperty() {super("FontName") ; }
  public void setProperty(Interp interp,
          TclObject tclObject) {
    FontName = tclObject.toString() ; }
  public TclObject getProperty(Interp interp) {
    return TclString.newInstance(FontName) ; }
} ;
```

When the Tcl interpreter calls `SetCommand` or `GetCommand`, the first argument is the name of the property. This value is cross-referenced in the property dictionary and if the resulting property is found, the appropriate method is called. All in all it turns out to be a relatively clean solution.

Jacl and Hyde

Although I found Jacl to be relatively easy to use I thought the documentation was organised a bit strangely. And the samples don't really give you much of a road map, so I spent more time looking for directions than I did solving any problems. If you don't immediately find your way from the docs and demos, be patient, and use my sample application as a starting point.

TclBlend and Jacl are available in source and binary form at *www.scriptics.com/java*. ■

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EXE ONLINE *The code for this article is available on EXE OnLine and via ftp at ftp://ftp.exe.co.uk/pub/exestuff/9812_java.*

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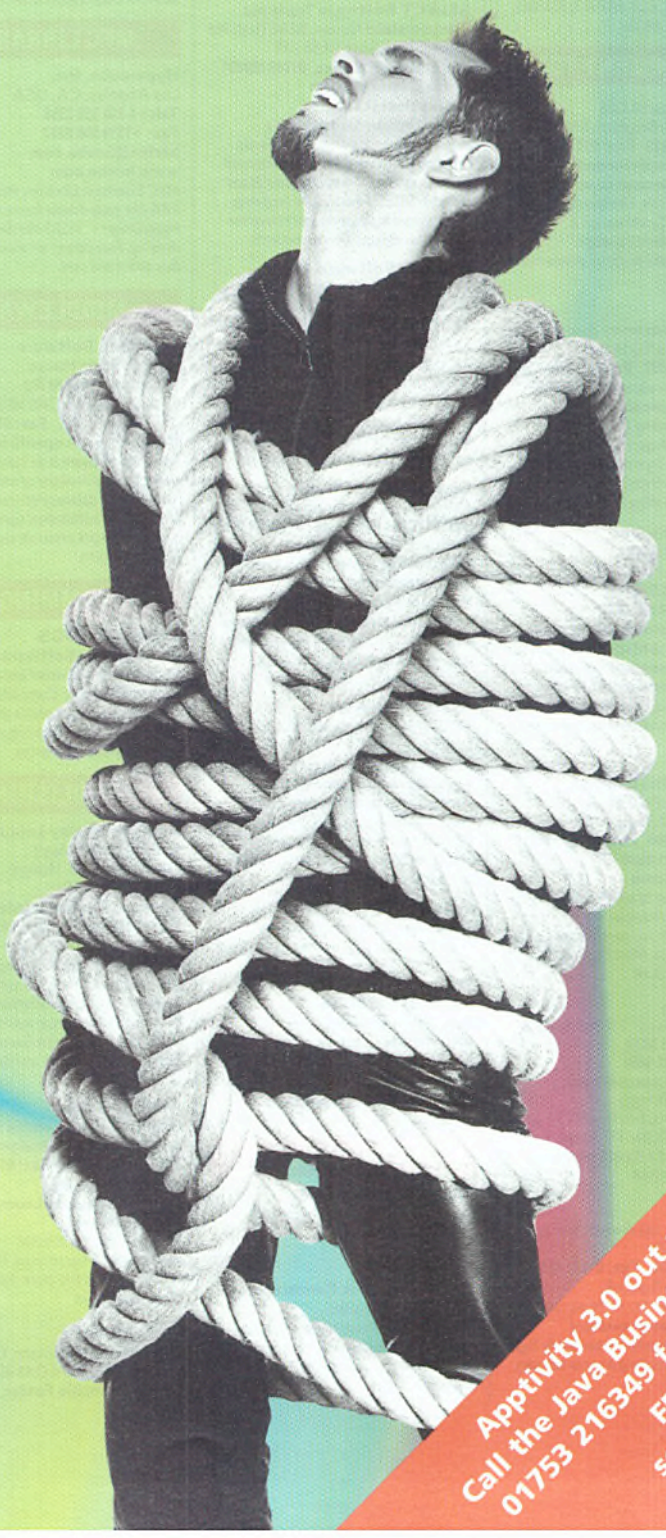

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The LostFocus of validation

Jon Perkins considers the problems with the LostFocus event that led Microsoft to introduce the Validate event, and he reviews the Graphics Server from Bits Per Second.

Up until now there have been three ways of validating user input in a Visual Basic form. First, all validation can be performed at the end of the information gathering, such as when the user presses OK or Apply. The first field that fails the validation, if there is one, is then made the focus target and perhaps a message box will be displayed. This approach is actually fine as long as you don't mind the fact that the validation around each individual field will not take place while the user's attention is placed directly upon it. The second approach is to place code directly into either the `KeyPress` or `Change` events, which only allows for limited validation because you can't be sure at this stage whether the user has completed the entire field input. It is unfriendly to throw up a validation message in this instance because the user might well have mistyped a character and could be intending to hit the backspace and retype it – a message box at this stage will be unwelcome. Therefore the only useful work that can be done here is to filter out invalid characters. The third way is to write the code into the `LostFocus` event, but this can lead to all sorts of problems. Consider the following code extracts for two text boxes where we are validating against empty fields (and both fields are in fact empty):

```
Private Sub Text1_GotFocus()
  Debug.Print "Text1.GotFocus"
End Sub
Private Sub Text1_LostFocus()
  Debug.Print "Text1.LostFocus"
  If Text1.Text = "" Then
    Text1.SetFocus
  End If
End Sub
Private Sub Text2_GotFocus()
  Debug.Print "Text2.GotFocus"
End Sub
Private Sub Text2_LostFocus()
  Debug.Print "Text2.LostFocus"
  If Text2.Text = "" Then
    Text2.SetFocus
  End If
End Sub
```

This code highlights a difficulty with event ordering in Visual Basic. If you run the above code when both `Text1` and `Text2` are empty and you press the tab button on the keyboard to move on to `Text2`, then you will almost certainly end up in a loop. The immediate window will display a continuous run of something along the lines of:

```
Text1.LostFocus
Text2.GotFocus
Text2.LostFocus
Text1.GotFocus
Text1.LostFocus
Text2.GotFocus
```

...and so on. The following sequence of events are occurring here:

1. Once `Text1` has had the focus taken away from it, `Text2` is flagged to receive the focus next. Then the code in `Text1_LostFocus` is run. However, by run I do not mean that everything happens as one would expect. The `Debug.Print` statement is displayed in the immediate window, but the command to set the focus back to `Text1` is actually posted into the application's message queue from where it will be processed in turn. However, because of the previous tab action, the message to set the focus to `Text2` is already further ahead in the queue and so will be executed beforehand.
2. As soon as the `Text2.SetFocus` message has been processed, the `Text1.SetFocus` message is encountered and an attempt is made to execute it.
3. As a result of the call to switch focus back to `Text1` the `Text2.LostFocus` event will automatically fire. The validation code will place a call to `Text2.SetFocus` into the message queue because the validation fails.
4. The call to `Text1.SetFocus` will fire, followed immediately by the call to `Text2.SetFocus`, which will automatically call the `Text1.LostFocus` routine, which will fail. And so on...

I should point out at this stage that this sequence of events is only an approximation of the true order of processing. In reality Windows does not guarantee the order in which messages are processed. When I was performing my own tests for this article (under Windows NT 4) there was nothing else of note taking place on the machine. However different load conditions, different versions of Windows, or even the fact that a butterfly just flapped its wings in the South American jungle could slightly alter the dynamics of this message queuing. Having emaphasised this point, the likely order of processing can be demonstrated by removing the `If..EndIf` block of code from the `Text2_LostFocus` routine. A tab action from the `Text1` control (again, empty) will probably just show the following four messages:

```
Text1.LostFocus
Text2.GotFocus
Text2.LostFocus
Text1.GotFocus
```

Understanding the nature of ordering that takes place can be very useful in resolving the type of looping problems that I described above.

The new Validate event

As a means of helping the developer to overcome these problems the Visual Basic team has introduced the `Validate` event. This is designed to run before the control loses focus, thereby preventing the need to place a `SetFocus` call into our code. The syntax for the event is defined as:

```
Private Sub object_Validate(KeepFocus As Boolean)
```

The *KeepFocus* argument (called `Cancel` in the actual code declaration) is the means by which you can prevent the focus from being lost. If the validation fails, then set this value to `True` and the focus won't go anywhere. A simple piece of code to demonstrate this use could be:

```
Private Sub Text1_Validate(Cancel As Boolean)
  If Text1.Text = "" Then
     Debug.Print "Text1 validation failed"
     Cancel = True
  End If
End Sub
```

The firing of the `Validate` event is governed by a property called `CausesValidation`. This property, however, is related to the other controls on the form, specifically on the control that the user attempts to shift focus to. If the `CausesValidation` property on the second control is set to `True` then the `Validate` event on the first control will fire. On the other hand if the property is set to `False` then the event won't fire. This property is get/let and is defined as:

Object`.CausesValidation [ = `*boolean*` ]`

To use this combination properly all data controls would probably have the `CausesValidation` property set to `True` (the default value). As the user tabs from one field to the next the contents of the current field can be properly validated before the actual focus changes. However any other controls, such as a Help command button, should have the `CausesValidation` property set to `False`. This will allow the requested course of action to take place without the interference of the validation failure code.

This concept requires just one further discipline, on the part of the programmer, to come together well. The actual validation code should not reside within each `Validate` event itself: a call to a separate validation function would be more efficient. This is because the new approach does not guarantee that all controls will have been subject to their respective validation routines – if the user entered a value, pressed Help, and then pressed OK, the `Validate` routine will not have fired. Therefore, it will be sensible to design a means of also calling the various validation routines from the 'OK' button before the data is committed to ensure that everything is correct.

Graphics Server review

Arguably one of the few 'core' third party products within the Visual Basic world, it's a refreshing fact that Graphics Server is actually written by a UK company, Bits Per Second, rather than an American one. The product offers a wider and more flexible range of graph types than the Microsoft Chart control that is supplied as standard with Visual Basic. For example, I was recently writing a front-end tool that displays the status of a set of SQL Server databases. It was my intention to offer a Properties option via a right mouse click that would show a 3D pie chart showing the amount of device space used and remaining. The standard chart control only offers 2D charts and so the result looked rather flat, especially when compared with a Drive Properties dialog when using the Windows Explorer. Using Graphics Server would, of course, have been one solution to this problem.

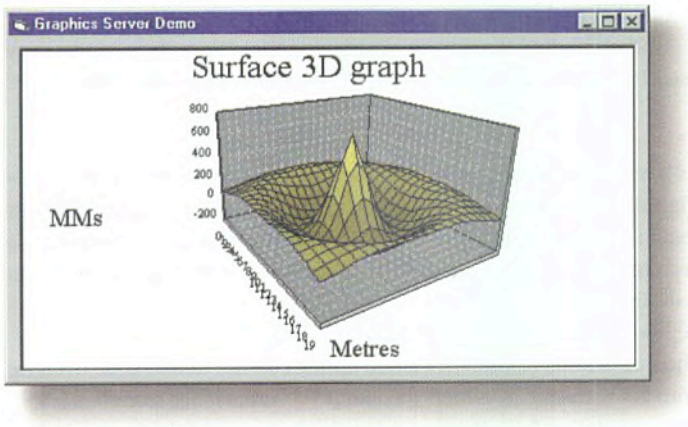

Figure 1 – An example surface graph.

The current edition, version 5, offers direct support for quite a few languages so a fair few redistributable component types are provided. As well as the OCX control that most Visual Basic programmers would expect, there is a DLL version, a C++ class, a Delphi VCL, and a FoxPro FLL. All of these components come in 16- and 32-bit form (there is a 16-bit VBX version too). There is also support for both client- and server-side Internet applications. All of these come as part of the one product, so there is no need to buy separate versions. For all the development languages there are plenty of sample projects that illustrate coding for different graph types.

To use the control within the IDE after the developers kit has been installed, check the 'Pinnacle-BPS Extended Graph' entry in the `Project|Components` dialog. Once the new control is added to the toolbox it can be dragged onto a form as normal. A custom properties dialog for the control displays numerous tabs that highlight the many aspects of functionality that the product offers. The control is data-aware and can be bound to the standard Data Control. Once a connection is made, the resulting chart will be able to automatically update itself if the underlying data changes. There is a large library of functions that can be called to create, show, and manipulate graphs programmatically.

In addition to the graph types supported by the Microsoft Chart control, Graphics Server offers 3D pie charts, surface graphs (see Figure 1 for an example), time-series graphs, scatter graphs, open-high-low-close ('Wall Street') graphs, bubble graphs, and... Well, you get the idea. To illustrate the positioning of the product within the development community, the American *Visual Basic Programmer's Journal* readership has consistently voted Graphics Server as the best graphing tool for the past seven years.

Do I have any criticisms? Well yes, a couple of minor ones, but both of these are being fixed in the next release. First, the printed documentation, although comprehensive, is a little untidy in that you are provided with two version 4 manuals, two version 4.5 addendum manuals, and a version 5 addendum. On this matter I have been informed that the next release will contain a proper 'version 6' set of manuals. My second point is that whenever your application makes use of the Graphics Server engine a Graphics Server button appears on the Windows taskbar. Clicking the button does not bring up a window of any kind and is therefore, I would argue, an incorrect design feature as it is closer to being a service than an application. Bits Per Second apparently accepts this point because the next version will instead display an icon in the system tray area of the taskbar, which is the correct location for a service that wishes to show its presence.

As I mentioned, there will soon be a version 6, which at the time of writing is due for release around January. Features include full compatibility with Visual Studio 6, and enhancements to the documentation, help files, samples, and the installation routine. And there will be improvements to the graphing engine itself in the form of increased data precision, improved printing, user-defined colour palettes, and improved GIF and JPG image handling. Further details on the product can be found at *http://www.contemporary.co.uk*. It is available from most UK software resellers, priced at £245. My thanks to Contemporary Software for the review copy. ■

Jon Perkins is a freelance Visual Basic developer and a Microsoft Certified Solution Developer. He is a contributing author of Advanced Microsoft Visual Basic by The Mandelbrot Set, published by Microsoft Press. Contact him at www.jonperkins.com.

SOFTWARE TRAINING GUIDE

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EXE ONLINE

CLIENT/SERVER

Course	Date	Days	Cost	Place	Company
Client/Server and Distributed Computing	Regularly	3	POA	Call	QA TR
Architecture and Design of Enterprise Systems	Regularly	4	POA	Call	QA TR
Software Testing	Regularly	3	POA	Call	QA TR
IT Infrastructure Implementation and Management	Regularly	4	POA	Call	QA TR
Architecture and Design of Enterprise Systems	Regularly	4	POA	Call	QA TR

DATABASE

Course	Date	Days	Cost	Place	Company
Database Analysis and Design	Regularly	3	POA	Call	QA TR
Building a Data Warehouse	Regularly	4	POA	Call	QA TR
Microsoft Access Development	Regularly	3	POA	Call	QA TR
Introduction to Microsoft Access	Regularly	2	POA	Call	QA TR
Programming with Microsoft Access Basic	Regularly	2	POA	Call	QA TR
SQL Language	Regularly	2	POA	Call	QA TR
Microsoft SQL Server and Transact-SQL Programming	Regularly	3	POA	Call	QA TR
Microsoft SQL Server 6.5 Administration	Regularly	5	POA	Call	QA TR
Implementing a Database Design on Microsoft SQL Server 6.5	Regularly	5	POA	Call	QA TR

GROUPWARE AND OFFICE SYSTEMS

Course	Date	Days	Cost	Place	Company
Lotus Notes/Domino R4.5 Application Development 1	Regularly	3	POA	Call	QA TR
Lotus Notes/Domino R4.5 Application Development 2	Regularly	4	POA	Call	QA TR
Lotus Notes/Domino R4.5 Application Development 3 and LotusScript	Regularly	4	POA	Call	QA TR
Lotus Notes/Domino R4.5 System Administration 1	Regularly	4	POA	Call	QA TR
Lotus Notes/Domino R4.5 System Administration 2	Regularly	2	POA	Call	QA TR
Introduction to LotusScript in Notes/Domino	Regularly	3	POA	Call	QA TR
Microsoft Exchange Server 5.5 - Concepts and Administration	Regularly	3	POA	Call	QA TR
Microsoft Exchange Server 5.5 - Design and Implementation	Regularly	5	POA	Call	QA TR
Supporting Microsoft Exchange 5.0 - Core Technologies	Regularly	5	POA	Call	QA TR
Microsoft Exchange Server Performance and Troubleshooting	Regularly	2	POA	Call	QA TR
Groupware Development with Microsoft Office Technologies	Regularly	5	POA	Call	QA TR
Domino Administration for Lotus Notes 4.6 and the Internet	Regularly	2	POA	Call	QA TR
Internet Development with Lotus Notes Domino 4.6	Regularly	3	POA	Call	QA TR
VBA Programming with Microsoft Excel	Regularly	4	POA	Call	QA TR

GUI DEVELOPMENT

Course	Date	Days	Cost	Place	Company
Application Development using Borland Delphi V3	Regularly	5	POA	Call	QA TR
Advanced Programming with Visual Basic Enterprise Edition	Regularly	4	POA	Call	QA TR
Building Object-Oriented Applications with PowerBuilder V5	Regularly	3	POA	Call	QA TR
Fast Track to PowerBuilder V5	Regularly	4	POA	Call	QA TR
Microsoft Visual Basic Primer	Regularly	1	POA	Call	QA TR
Application Development using Visual Basic	Regularly	4	POA	Call	QA TR

INTERNET

Course	Date	Days	Cost	Place	Company
Programming with JavaScript	Regularly	2	POA	Call	QA TR
Creating and Configuring a Web Server using Microsoft Tools	Regularly	3	POA	Call	QA TR
Internetworking with Microsoft TCP/IP on Windows NT 4	Regularly	5	POA	Call	QA TR
Internet Fundamentals	Regularly	3	POA	Call	QA TR
Intranet Design and Migration	Regularly	3	POA	Call	QA TR
Internet and Intranet Security	Regularly	3	POA	Call	QA TR
Building an Effective Web Site	Regularly	3	POA	Call	QA TR
Netscape SuiteSpot Server v3	Regularly	5	POA	Call	QA TR
Internetworking with TCP/IP	Regularly	4	POA	Call	QA TR
Programming with Visual Basic Script	Regularly	2	POA	Call	QA TR

LANGUAGES

Course	Date	Days	Cost	Place	Company
Advanced C	Regularly	4	POA	Call	QA TR
Advanced C++ Development Techniques	Regularly	4	POA	Call	QA TR
C++ for non-C Programmers	Regularly	5	POA	Call	QA TR
C++ for C Programmers	Regularly	4	POA	Call	QA TR

SOFTWARE TRAINING GUIDE

Course	Date	Days	Cost	Place	Company
C++ Primer	Regularly	2	POA	Call	QA TR
C Primer	Regularly	2	POA	Call	QA TR
C Programming	Regularly	4	POA	Call	QA TR
Developing JavaBeans	Regularly	5	POA	Call	QA TR
Java for non-C Programmers	Regularly	5	POA	Call	QA TR
Java Primer	Regularly	2	POA	Call	QA TR
Java for C/C++ Programmers	Regularly	4	POA	Call	QA TR
Mastering Microsoft Visual Java J++	Regularly	5	POA	Call	QA TR
Database Development using Symantec Visual Café	Regularly	3	POA	Call	QA TR

NETWARE

NetWare 3 Support and Administration	Regularly	4	POA	Call	QA TR
IntranetWare Support and Administration using Windows NT	Regularly	5	POA	Call	QA TR
IntranetWare: NetWare 4.x Administration	Regularly	5	POA	Call	QA TR
IntranetWare: NetWare 4.x Advanced Administration	Regularly	3	POA	Call	QA TR

NETWORKING

Understanding ATM	Regularly	2	POA	Call	QA TR
Introduction to Data Communications	Regularly	2	POA	Call	QA TR
Enterprise-wide Communications and Networking	Regularly	4	POA	Call	QA TR
Local Area Network Implementation & Management	Regularly	4	POA	Call	QA TR
Network Primer	Regularly	1	POA	Call	QA TR

OBJECT ORIENTED TECHNOLOGY

Advanced IBM Smalltalk	25/1	5	1375	London	OBJE
Advanced IBM Smalltalk	22/3	5	1375	Southampton	OBJE
Advanced IBM Smalltalk	17/5	5	1375	London	OBJE
Building Applications using VisualAge for Smalltalk Technology	18/1	5	1375	Southampton	OBJE
Building an Application Server using VisualAge/Smalltalk Server	3/3	3	895	Southampton	OBJE
Building an Application Server using VisualAge/Smalltalk Server	26/5	3	895	Southampton	OBJE
Introduction to VisualAge	11/1	5	1375	London	OBJE
Introduction to VisualAge	8/2	5	1375	Southampton	OBJE
Introduction to VisualAge	8/3	5	1375	Southampton	OBJE
Introduction to VisualAge	12/4	5	1375	Southampton	OBJE
Introduction to VisualAge	7/6	5	1375	London	OBJE
Programming in IBM Smalltalk	15/2	5	1375	London	OBJE
Programming in IBM Smalltalk	26/4	5	1375	London	OBJE
Programming in IBM Smalltalk	14/6	5	1375	Southampton	OBJE
VisualAge for Smalltalk Programmers	1/2	5	1375	Southampton	OBJE
VisualAge for Smalltalk Programmers	10/5	5	1375	Southampton	OBJE
Round-trip Engineering with VisualAge/Smalltalk UML Designer	Call	3	call	Southampton	OBJE
Enabling Persistence with VisualAge/Smalltalk Object Extender	Call	3	call	Southampton	OBJE

Course	Date	Days	Cost	Place	Company
MVS Smalltalk:Transaction Managed Objects	Call	3	Call	Southampton	OBJE
Building & using Java Beans	6/5	2	650	Southampton	OBJE
Building Distributed Applications with VisualAge for Java	22/4	2	650	Southampton	OBJE
Building Distributed Applications with VisualAge for Java	17/6	2	650	ptSouthamon	OBJE
Building Applications using VisualAge for Smalltalk	15/3	5	1375	Southampton	OBJE
Building Applications using VisualAge for Smalltalk	19/4	5	1375	Southampton	OBJE
Building Applications using VisualAge for Smalltalk	21/6	5	1375	Southampton	OBJE
Team Programming using VisualAge for Smalltalk	7/1	2	650	Southampton	OBJE
Team Programming using VisualAge for Smalltalk	8/4	2	650	Southampton	OBJE
Team Programming using VisualAge for Smalltalk	3/6	2	650	Southampton	OBJE
OO Programming with VisualAge for Java	21/6	5	1250	Southampton	OBJE
Building Applets & Applications with VisualAge for Java	26/4	5	1250	Southampton	OBJE
Building Applets & Applications with VisualAge for Java	24/5	5	1250	Southampton	OBJE
Building Applets & Applications with VisualAge for Java	28/6	5	1250	Southampton	OBJE
Team Programming using VisualAge for Java	8/4	2	650	Southampton	OBJE
Object-Oriented Modelling with VisualAge/Smalltalk UML Designer	8/2	4.5	1450	Southampton	OBJE
Object-Oriented Modelling with VisualAge/Smalltalk UML Designer	10/5	4.5	1450	Southampton	OBJE
OO Programming with VisualAge for Java	17/5	5	1250	Southampton	OBJE
Team Programming using VisualAge for Java	1/6	2	650	Southampton	OBJE
Building TOPLink Enabled Java Applications	14/4	3	1150	Southampton	OBJE
Building TOPLink Enabled Java Applications	14/6	3	1150	Southampton	OBJE
Object-Oriented Concepts Analysis & Design	Call	3	Call	Sothampton	OBJE
Object-Oriented Analysis and Design using the Booch Method	Regularly	4	POA	Call	QA TR
Object-Oriented Analysis and Design using Rumbaugh's OMT	Regularly	5	POA	Call	QA TR
Developing CORBA Applications	Regularly	3	POA	Call	QA TR
Object-Oriented Design for C++ Development	Regularly	5	POA	Call	QA TR
Overview of Distributed Objects	Regularly	1	POA	Call	QA TR
Object-Oriented Primer	Regularly	1	POA	Call	QA TR
Object-Oriented Software Development	Regularly	3	POA	Call	QA TR
Object-Oriented Analysis and Design using the Unified Modelling Language	Regularly	5	POA	Call	QA TR
Technical Introduction to Java	18/01	Call	POA	London	VAL
Technical Introduction to Java	15/02	Call	POA	London	VAL
Technical Introduction to Java	15/03	Call	POA	London	VAL
Developing with Java for C++	25/01	Call	POA	London	VAL
Developing with Java for C++	22/02	Call	POA	London	VAL
Developing with Java for C++	22/03	Call	POA	London	VAL
Java for Non C++ (new for 99)	01/03	Call	POA	London	VAL
Java Enterprise Architectures	19/01	Call	POA	London	VAL
Java Enterprise Architectures	16/02	Call	POA	London	VAL
Java Enterprise Architectures	16/03	Call	POA	London	VAL
Developing with JavaBeans	11/01	Call	POA	London	VAL
Developing with JavaBeans	.01/02	Call	POA	London	VAL
Developing with JavaBeans	01/03	Call	POA	London	VAL
Developing with JavaBeans	29/03	Call	POA	London	VAL

SOFTWARE TRAINING GUIDE

Course	Date	Days	Cost	Place	Company
Developing a Java Client with JFC	11/01	Call	POA	London	VAL
Developing a Java Client with JFC	29/03	Call	POA	London	VAL
Developing a Server with Java	0802	Call	POA	London	VAL
Enterprise JavaBeans	11/01	Call	POA	London	VAL
Enterprise JavaBeans	08/02	Call	POA	London	VAL
Enterprise JavaBeans	08/03	Call	POA	London	VAL
Java Virtual Machine	08/03	Call	POA	London	VAL
Technical Intro to Corba	25/01	Call	POA	London	VAL
Technical Intro to Corba	22/02	Call	POA	London	VAL
Technical Intro to Corba	22/03	Call	POA	London	VAL
VisiBroker for Java	11/01	Call	POA	London	VAL
VisiBroker for Java	08/03	Call	POA	London	VAL
VisiBroker for Java	08/03	Call	POA	London	VAL
Advanced VisiBroker for Java	18/01	Call	POA	London	VAL
Advanced VisiBroker for Java	15/02	Call	POA	London	VAL
Advanced VisiBroker for Java	15/03	Call	POA	London	VAL
Orbix C++	25/01	Call	POA	London	VAL
Orbix C++	22/02	Call	POA	London	VAL
Orbix C++	22/03	Call	POA	London	VAL
Orbix Web	11/01	Call	POA	London	VAL
Orbix Web	08/03	Call	POA	London	VAL
Corba Enterprise Architectures	26/01	Call	POA	London	VAL
Corba Enterprise Architectures	23/02	Call	POA	London	VAL
VAL Corba Enterprise Architectures	23/02	VAL	Call	POALondon	VAL
Analysis with UML 1.1	18/01	Call	POA	London	VAL
Analysis with UML 1.1	15/02	Call	POA	London	VAL
Analysis with UML 1.1	15/03	Call	POA	London	VAL
Building a Java Application using UML and Design Patterns (new for 99)	01/03	Call	POA	London	VAL
Developing with C++	04/01	Call	POA	London	VAL
Developing with C++	01/02	Call	POA	London	VAL
Developing with C++	01/03	Call	POA	London	VAL
Developing with C++	29/03	Call	POA	London	VAL
Non C Programmers (new for 99) Using Rose	01/02	Call	POA	London	VAL
Non C Programmers (new for 99) Using Rose	01/02	Call	POA	London	VAL
Non C Programmers (new for 99) Using Rose	01/03	Call	POA	London	VAL
Non C Programmers (new for 99) Using Rose	29/03	Call	POA	London	VAL
Non C Programmers (new for 99) Using Rose	04/01	Call	POA	London	VAL
Developing with C++ and MFC	11/01	Call	POA	London	VAL
Developing with C++ and MFC	08/02	Call	POA	London	VAL
Developing with C++ and MFC	08/03	Call	POA	London	VAL
Active X and MFC	04/01	Call	POA	London	VAL
Active X and MFC	01/03	Call	POA	London	VAL
Active X and ATL	15/02	Call	POA	London	VAL
Developing an Intranet with Visual Interdeveloper	25/01	Call	POA	London	VAL
Developing an Intranet with Visual Interdeveloper	22/02	Call	POA	London	VAL
Developing an Intranet with Visual Interdeveloper	22/03	Call	POA	London	VAL
Developing a Web Site with Frontpage	18/01	Call	POA	London	VAL

Course	Date	Days	Cost	Place	Company
Developing a Web Site with Frontpage	15/03	Call	POA	London	VAL
Intro to Distributed Security Architectures	25/01	Call	POA	London	VAL
Intro to Distributed Security Architectures	22/03	Call	POA	London	VAL
Designing Distributed Security Architectures	26/01	Call	POA	London	VAL
Designing Distributed Security Architectures	23/03	Call	POA	London	VAL
Developing a Web Site (new for 99)	08/02	Call	POA	London	VAL
Technical Introduction to Java	25/01	Call	POA	Manchester	VAL
Technical Introduction to Java	22/03	Call	POA	Manchester	VAL
Developing with Java for C++	01/02	Call	POA	Manchester	VAL
Developing with Java for C++	29/03	Call	POA	Manchester	VAL
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Java Enterprise Architectures	01/03	Call	POA	Manchester	VAL
Developing with JavaBeans	08/02	Call	POA	Manchester	VAL
Developing a Java Client with JFC	08/03	Call	POA	Manchester	VAL
Developing a Server with Java	18/01	Call	POA	Manchester	VAL
Developing a Server with Java	15/03	Call	POA	Manchester	VAL
Enterprise JavaBeans	01/026	Call	POA	Manchester	VAL
Java Virtual Machine	15/02	Call	POA	Manchester	VAL
Technical Intro to Corba	04/01	Call	POA	Manchester	VAL
Technical Intro to Corba	01/03	Call	POA	Manchester	VAL
VisiBroker for Java	18/01	Call	POA	Manchester	VAL
VisiBroker for Java	15/03	Call	POA	Manchester	VAL
Advanced VisiBroker for Java	22/02	Call	POA	Manchester	VAL
Orbix C++	01/02	Call	POA	Manchester	VAL
Orbix Web	15/02	Call	POA	Manchester	VAL
Corba Enterprise Architectures	05/01	Call	POA	Manchester	VAL
Corba Enterprise Architectures	22/03	Call	POA	Manchester	VAL
Analysis with UML 1.1	25/1	Call	POA	Manchester	VAL
Analysis with UML 1.1	22/3	Call	POA	Manchester	VAL
Developing with C++	1/3	Call	POA	Manchester	VAL
Developing with C++ for	15/3	Call	POA	Manchester	VAL
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Developing an Intranet with Visual Interdeveloper	01/03	Call	POA	Manchester	VAL
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Intro to Distributed Security Architectures	01/03	Call	POA	Manchester	VAL
Designing Distributed Security Architectures	05/01	Call	POA	Manchester	VAL
Designing Distributed Security Architectures	02/03	Call	POA	Manchester	VAL

PC SUPPORT

Advanced PC Support	Regularly	4	POA	Call	QA TR

SOFTWARE TRAINING GUIDE

Course	Date	Days	Cost	Place	Company
PC Fundamentals	Regularly	3	POA	Call	QA TR
PC Support	Regularly	4	POA	Call	QA TR

PROGRAMMING

Developing Windows NT Server Applications	Regularly	5	POA	Call	QA TR
Mastering Web Site Development using Visual InterDev	Regularly	5	POA	Call	QA TR
Win32 Programming Essentials	Regularly	5	POA	Call	QA TR
Developing ActiveX Controls and Components	Regularly	5	POA	Call	QA TR
Windows Programming in C	Regularly	5	POA	Call	QA TR
Windows Programming with Visual C++ and the MFC Library	Regularly	5	POA	Call	QA TR
Building Applications with Microsoft Transaction Server	Regularly	5	POA	Call	QA TR
Fasttrack Windows NT 5 for Developers	Regularly	2	POA	Call	QA TR
Windows OLE Programming with the MFC Library	Regularly	5	POA	Call	QA TR
Developing OLE/ActiveX Controls with the MFC Library	Regularly	5	POA	Call	QA TR
Windows OLE System Programming	Regularly	5	POA	Call	QA TR

PROJECT MANAGEMENT

Managing Enterprise Software Development Projects	Regularly	3	POA	Call	QA TR
DSDM Practitioner	Regularly	3	POA	Call	QA TR
Project Management Skills	Regularly	4	POA	Call	QA TR

UNIX

UNIX Fundamentals	Regularly	4	POA	Call	QA TR
UNIX Programming	Regularly	5	POA	Call	QA TR
UNIX Systems Administration	Regularly	4	POA	Call	QA TR
Mastering UNIX Shell Scripts	Regularly	4	POA	Call	QA TR
Solaris Systems Administration	Regularly	4	POA	Call	QA TR

WINDOWS NT

Administering Microsoft Windows NT 4.x	Regularly	3	POA	Call	QA TR
Supporting Windows NT Server 4.x - Enterprise Technologies	Regularly	5	POA	Call	QA TR
Supporting Windows NT 4.x - Core Technologies	Regularly	5	POA	Call	QA TR
Supporting Microsoft Systems Management Server	Regularly	5	POA	Call	QA TR
Supporting Microsoft SNA Server V4	Regularly	5	POA	Call	QA TR
Windows NT 4.x Essentials	Regularly	4	POA	Call	QA TR
Windows NT 5 Essentials	Regularly	5	POA	Call	QA TR
Supporting Windows NT 4.x Servers	Regularly	4	POA	Call	QA TR
Implementing Windows NT 5 Active Directory	Regularly	3	POA	Call	QA TR

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Web: http://www.objectpeople.com/uk/

The Object People have a world-wide reputation in assisting clients adopt and make successful progress with object technology. Services include: general Java and Smalltalk Training/Consultancy/Migration. We also specialise in VisualAge and VisualWorks. In addition, we provide courses to cover Object-Oriented Analysis and Design techniques, as well as Object Technology Management Overviews.

Our consultants/trainers are highly skilled in a wide range of development environments. We therefore offer a tailor-made Migration Service to assist transition to Java or Smalltalk from other OO languages or between different Smalltalk systems.

Key QA TR QA Training Ltd

Cecily Hill Castle, Cirencester, Gloucestershire, GL7 2EF

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Web: http://www.qatraining.com

QA Training is widely recognised as the premier IT training company in the UK and the largest provider of technical training to IT professionals. We offer over 150 programming and support courses and are major business partners and accredited trainers of Compaq, Hewlett-Packard, Lotus, Microsoft, Netscape, Novell, Oracle and Powersoft amongst others. More than that, we actually provide internal training to companies like Microsoft on their own products in advance of release. This makes us the first to understand and provide training and consultancy on the latest technologies to our customers.

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Valtech is an international training and consulting group offering a wide range of courses, to transfer the expertise to develop new multi-tier systems. Valtech has trained 5000 people throughout Europe in 1997, and is recognized as the European leader in Object Technology Transfer.

EXE ONLINE

EXE Software Training Guide, produced by EXE Magazine, Centaur Communications Ltd, St Giles House, 50 Poland Street, London W1V 4AX
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If you would like to include your Training Listings in our next guide, please call advertising on 0171 970 4838.

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EXE brings you the cream of vacancies in the development and programming business.
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THE UK'S LEADING SUPPLIER OF I.T. STAFF

JAVA/WEB

0117 988 0000 • Peter Shawyer

E-COMMERCE CONSULTANTS
BRISTOL/S. GLOCS — **TO £40,000 +BENS**

The Internet development team of this highly successful IT consultancy need developers with commercial experience in C++ or **Java**. The opportunity is perfect for experienced A/P's who want to progress their career in a cutting-edge e-commerce/Internet environment. This prestigious organisation rewards their employees with highly competitive salaries and benefits, along with training as and when you need it. (Ref:X/7560)

INTERNET DEVELOPERS - GAIN JAVA
GLOUCESTERSHIRE — **TO £40,000 +BENS**

With a turnover of $4 billion, this organisation is a leading provider of interactive multimedia training courses, delivered on the Web, Intranets and LAN-CD, for a range of renowned multinational clients. If you can demonstrate an understanding of C++ or **Java** and **Active X** or **JavaBeans**, you can cross-train in whichever **OO** language you do not already know and gain experience of **GUI** development and **network protocols**, whilst working on the creation of leading-edge Internet delivery systems. An excellent salary, comprehensive benefits and idyllic location round off the package. (Ref:X/8282)

BECOME A JAVA/CORBA DEVELOPER
BATH — **TO £50,000 +CAR**

This dynamic software house, a leading provider of Intranet and Java applications, need **Java** and **Corba** Developers at all levels, ideally with **e-commerce**, management and strategy experience, to get involved in all stages of the project lifecycle. These opportunities encompass pioneering web-centric development projects, accredited training in Java and Corba, irresistible remuneration packages, bonuses, car and whatever is required to entice the best people to join. (Ref:X/8683)

OO/WEB DEVELOPERS - LISTEN UP
WORCESTERSHIRE — **TO £40,000 +RELOC**

This organisation is a leader in the field of speech recognition, deploying ground-breaking speech recognition-enabled services over the telephone and Internet. They require accomplished OO Software Engineers with any blend of: **C/C++, Com/DCom, Active X, ASP** and **HTML** (training provided). You can work with the most advanced web development tools, earn an excellent salary and develop your career in a dynamic, world-class technical organisation whilst enjoying the lifestyle benefits of working in this beautiful part of the country. (Ref:X/7817)

THE FUTURE IN WEB DESIGN
SWINDON/BATH — **TO £23,000 +BENS**

This leading Internet/Intranet Software house and ISP are seeking Web Designers with a minimum of 6 months' **HTML/DHTML, VBScript, JavaScript** and general graphics design skills. This is your chance to secure a career in a well established, pioneering organisation which has the largest Java applications centre in the region. They can offer you unparalleled career progression and a pay structure to recognise your worth, including bonus and share options. (Ref:X/8806)

INSURING E-COMMERCE
BRISTOL/SOUTH GLOUCESTERSHIRE — **TO £30,000**

The leading provider of e-commerce services to the financial sector need a Developer to take responsibility for ongoing improvements to the e-commerce software, implement changes and provide troubleshooting/technical advice. Programming skills with any of the following are of interest, although training is available: **ASP, DCom, DHTML, VB, C++, SQL Server**. The environment is entirely MS/Internet based, the training is second to none and the salary package will beat your market rate. (Ref:PS/9031)

BATH	JAVA DEV - GAIN COM/DCOM, OLE	TO £35,000
S'SET	JAVASCRIPT, ANY 3GL - GAIN JAVA	TO £23,000
BRISTOL	JAVA A/P - INTRANET/E-COMMERCE	£15-20,000
SWINDON	JAVA/CORBA, OO DEVELOPERS	£20-35,000
WILTS	JAVA/CORBA DEV - GAIN ORACLE	TO £33,000
WORCS	JAVA/C++, WORKFLOW/WEB PROJS	TO £35,000
GLOS	C++, ASP, VB, DCom - SUPPORT A/P	TO £30,000
DORSET	WEB DESIGN, JAVASCRIPT, HTML	TO £20,000
SWINDON	LOTUS DOMINO DEV, HTML	£25-37,000

VB/DELPHI

0117 988 0000 • Peter Bennett

GROW WITH THE COMPANY
BRISTOL — **TO £30,000**

Based in prestigious offices our client supplies integrated image data capture systems to the UK and US markets. If you are a accomplished **Visual Basic** Programmer, this is an opportunity for you to pioneer the latest developments in this exciting field, utilising and harnessing the following leading edge technologies: **Visual Basic V5, Active X, ODBC**, with a **Windows NT** environment. You will enjoy unparalleled exciting career progression and a very attractive salary. (Ref:PB/6395)

SENIOR VB DEVELOPERS
GLOUCESTER — **TO £30,000 +BENS**

This provider of software and hardware to the independent Insurance sector is looking for Microsoft Professional, from recent Graduates to Senior Developers. You will be using **Visual Basic**, with (not necessarily all) **Active X, Com, SQL Server, Version Control** and **Automated Test Tools**. Involved in the full project lifecycle you will receive full training up to Microsoft certified solutions status coupled with a fantastic salary and full benefits. (Ref:PB/8424)

DELPHI DEVELOPERS
BRISTOL — **TO £32,000**

Being one of the major systems houses in the UK, our client delivers high-level customer service, providing practical information management solutions through computer technology. An exciting opportunity has been created for a Senior **Delphi** Developer. Based in a prestigious and attractive waterfront location you will benefit not only from a highly lucrative package, but also their progressive and technically-innovative approach. (Ref:PB/9030)

VISUAL BASIC GAIN MCSD
DORSET — **TO £38,000**

Being one of the UK's top IT solution providers, serving clients in Europe, Scandinavia and Africa, our client has opportunities which come along once in a lifetime. They have several openings within this exciting environment for a Senior Developer/Analyst and Software Developer. You will be developing applications using your varying degrees of experience with **Visual Basic V4** or **5**. It would be beneficial to have **SQL Server** and **Microsoft Access**, although you will receive training as and when required to propel you to Microsoft Certified Solutions Developer status. (Ref:PB/6152)

SHEER BRILLIANCE
WILTSHIRE — **TO £27,000 +BENS**

Within the Software Development Team of this multinational supplier of products to the pharmaceutical and health markets, a number of exciting opportunities have arisen. You will be involved in the full project lifecycle of both the bespoke and off-the-shelf software solutions using **Visual Basic V3/4/5** and **Access** within a **Windows NT4** environment. You will receive an excellent salary with full benefits and full training, including Oracle Web Server, and other cutting edge technologies. (Ref:PB/8930)

ACCELERATE YOUR CAREER!
DORSET — **TO £35,000**

Based in an idyllic location our client has a new position for a Senior Delphi Software Engineer/Project Manager. You will be developing their ground breaking systems for the motor trade working in a dedicated, stimulating environment. Alongside good **Delphi** skills you will have a proven track record using **SQL Server, OOA/OOD** preferably **OOP** skills. As well as working in this beautiful part of the world, you will receive an excellent salary and full benefits. (Ref:PB/8988)

BRISTOL	VISUAL BASIC SENIOR S/W ENGINEER	TO £33,000
WORCS	VISUAL BASIC/RAD DEVELOPERS	TO £28,000
WILTS	VISUAL BASIC PROJECT MANAGERS	TO £42,000
BRISTOL	VISUAL BASIC/ACCESS DEVELOPERS	TO £30,000
WILTS	VISUAL BASIC/SQL ANALYST PROGS	TO £32,000
DEVON	DELPHI PROGS/SENIOR DEVELOPERS	TO £38,000
BRISTOL	RAD DEVELOPERS	TO £31,000
GLOS	VISUAL BASIC GAIN ORACLE	TO £29,000
DORSET	VISUAL BASIC/OOD/OOA/NT	TO £25,000
TAUNTON	SENIOR VISUAL BASIC V5 DEVS	TO £31,000
BRISTOL	DEVELOPERS PM IN DELPHI/NT	TO £39,500
WORCS	SENIOR PM/VISUAL BASIC/RDO	TO £41,000

C/C++

0117 988 0000 • Robin Hunt

QUALITY OF LIFE
SOMERSET — **TO £45,000 +BENS**

There is no limit to your career progression with this world leader in mission critical business software. Senior Software Engineers are sought with experience of **C/C++** and **Windows (NT/95)** to be involved in the design, development and implementation of their innovative range of software. Comprehensive benefits package an excellent salary and the lifestyle benefits of working in this serene part of the country make this the opportunity not to be missed. (Ref:RH/7389)

LEADING-EDGE TECHNOLOGY
BRISTOL — **TO £30,000 +BENS**

Build your future with a successful and dynamic business specialising in the development of flight simulators and air traffic control systems. Your role as a Senior Software Engineer will involve design and integration using **C/C++, Windows NT/95, ADA** and embedded systems. You will receive an attractive salary with a host of excellent benefits. (Ref:RH/8714)

COM/DCOM SPECIALIST
WILTSHIRE — **TO £35,000 +BENS**

This world market leader in telecommunications stays at the top through hard work, innovation, enthusiasm and technical advancement. Due to continued expansion additional Senior Software Engineers are sought to be based within its GSM centre. You will be involved in producing imaginative solutions using **Windows NT, C/C++, Com, DCom, Active X** and **MFC**, rewarding you with an excellent salary coupled with an attractive benefits package. (Ref:RH/9021)

SAVE THE ENVIRONMENT
DORSET — **TO £37,000 +BENS**

Our successful client specialises in the design and manufacture of instrumentation and systems for monitoring the environment. Senior Software Engineers are required to cover all aspects of software development including the design, coding, testing and integration of their cutting-edge products using **C/C++**, embedded systems and **Windows 95/NT**. In return you will receive a generous salary, relocation assistance and an extensive benefits package. (Ref:RH/8616)

CLASS OF ITS OWN
WORCESTERSHIRE — **TO £35,000 +BENS**

Formed to exploit the significant software-related opportunities within the Government and avionics industry, our client is looking to recruit Senior Software Engineers with experience of **C/C++, MFC** and **Windows NT**. You will be involved in the development of secure data links in an aircraft trials role. Latest technology, generous salary, excellent benefits package, career progression. (Ref:RH/8973)

C/C++ SENIOR ANALYST PROGRAMMERS
BRISTOL — **TO £35,000 +BENS**

Our client is a leading authority in the supply of direct marketing software services to major UK organisation. As a result of their flagship product's success, 2 Senior Analyst Programmers are required to get involved in all aspects of the development life-cycle. The ideal candidate will have at least 2 years experience of **C/C++, Windows NT** and preferably **Com/DCom**. You will receive an excellent salary, an unrivalled benefits package and an opportunity to mould your career. (Ref:DV/8008)

S'SET	C/C++ SENIOR S/W ENGINEERS X5	TO £40,000
BRISTOL	C/C++ PRINCIPLE S/W ENGINEER	TO £45,000
WILTS	C/C++ S/W ENGINEERS	TO £32,000
BATH	EMBEDDED C/C++ SNR S/W ENGS	TO £35,000
GLOS	VISUAL C++ S/W ENGINEERS X3	TO £34,000
BRISTOL	C/C++ SNR SOFTWARE DESIGNER	TO £36,000
WILTS	VISUAL C++ SENIOR X5	TO £45,000
DEVON	C/C++ SOFTWARE ENGINEERS	TO £30,000

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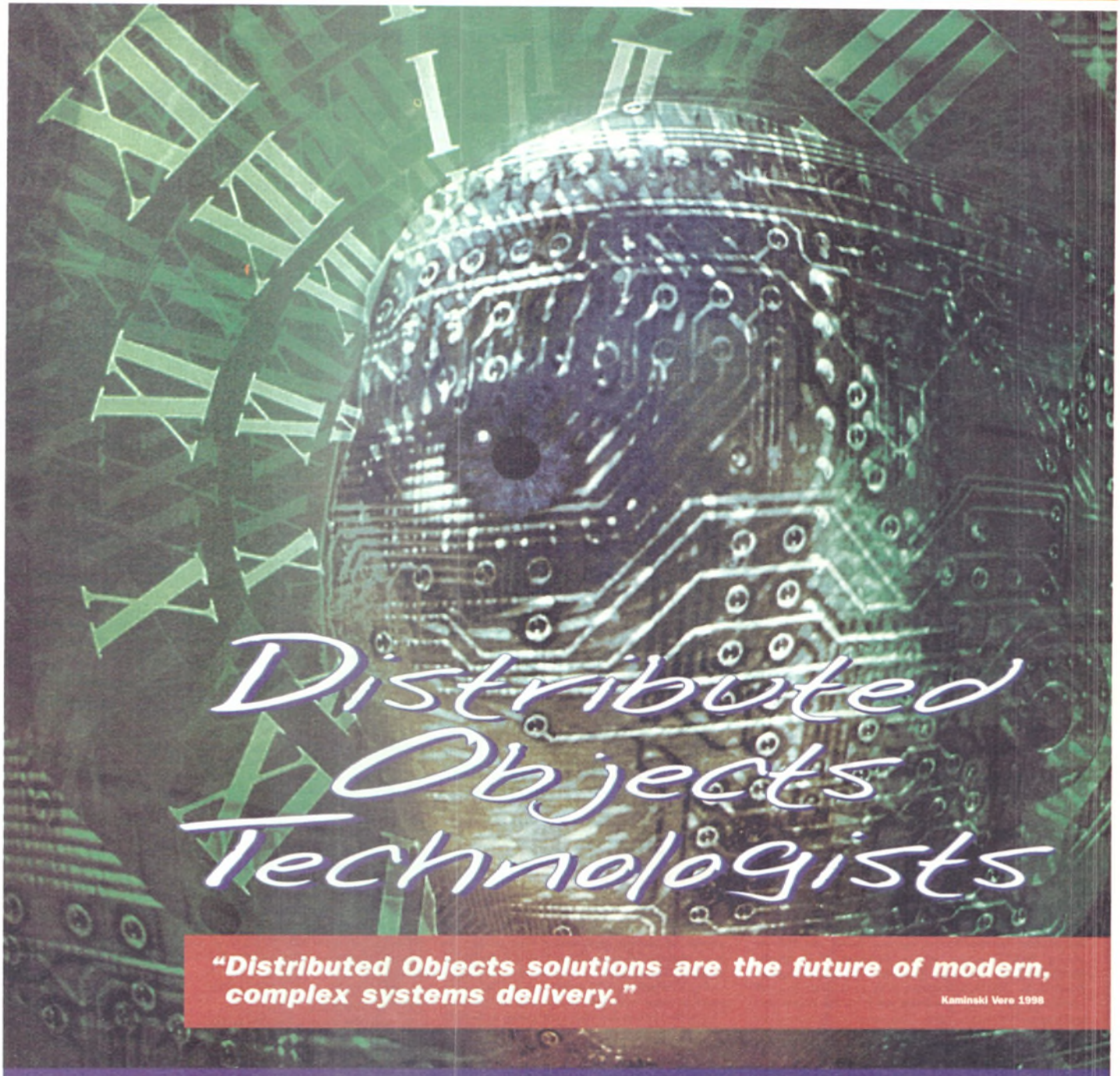

"Distributed Objects solutions are the future of modern, complex systems delivery."
Kaminski Vere 1998

TO £50,000 + BENEFITS

The objects oriented marketplace is expanding rapidly. Our client is one of Europe's largest **Object Components Technology Consultancies.** They are the owners and drivers of some of the largest change programmes based on distributed objects solutions in Europe, in fact, in the world!

Because of their rapid growth they now need to expand their Objects Group to include more Object Team Leaders, Object Modellers, Object, Architects, and Object Mentors.

This opportunity will enable the ideal candidates to grow and develop in this ever changing distributed objects universe. They are at the forefront of this change using effectively distributed components such as **DCOM**, **CORBA** or **JAVA** to name but a few.

They now require dedicated Objects Technologists with 3+ years experience and more importantly those who are dedicated to the development of distributed objects solutions of the future.

SCOTLAND, SOUTH EAST, WEST MIDLANDS & AVON

To qualify for this superb opportunity, you need to have experience in the following:-

- Exposure to at least one of the following environments, C++, Forte, Java and Visual Basic 5.
- Exposure to any one of the following distributed middleware environments such as:- MTS, MSMQ, CORBA, COM/DCOM, COM+, TUXEDO, RMI, MQ Series and DCE.
- Exposure to any one of the following databases:- Oracle, Versant, SQL Server, ObjectStore and Sybase.
- Exposure to any one of the following methods and standards:- UML, OMT, Ojectectory and Iterative/Incremental Development Lifecycles
- Experience of OO Analysis and Design using Rational Rose or Select Enterprise would be a major advantage

These fantastic opportunities are available in the above locations. These roles will include training and cross-training into the latest and greatest objects technology solutions available on the world stage. If you would like to make the next step and become the Distributed Objects Technologist of the future then please send your current cv quoting reference JGOO/998(G) to Marie Hanley at Careerwise U.K. Ltd, 35 Woolstone Road, London SE23 2TR.

Tel: +44(0)181 291 7334
(answer service)
Fax: +44(0)181 291 7550,
E-mail:
crrwise@aol.com

Please note, career development is very important in this company and all candidates will have a clear career path ahead of them.

Career wise
COMPUTER CAREER CONSULTANTS

In and Around West Yorkshire

We have clients currently seeking the following:

Developer/Junior Consultant to develop application interfaces using Visual BASIC.....**£25,000 to £30,000 + world wide travel**

'C'/'C++'/UNIX Developer with SQL ability for Internet solutions & database work .....**£18,000 to £25,000**

SQL/Visual BASIC Developers for database applications.....**£18,000 to £23,000**

'C'/'C++' Developers for industrial & complex commercial development.....**£18,000 to £23,000**

IBM Assembler (BAL) Programmers (can include re-training of forgotten skills!).....**to £28,000**

Junior Programmer with Visual BASIC or Visual 'C' skills for telephony applications.....**£neg + strong career development**

'C'/'C++'/Assembly Language Developers for real time applications.....**£28,000**

'C++'/HTML Developers for Internet applications **£28,000**

Software Development Project Leader for small Visual BASIC development team .....**£26,000 + car**

For your next career move around West Yorkshire telephone **Vincent Atherton** on **Leeds (0113) 250 4560** or write to:
AIREDALE RECRUITMENT
Realtex House, Micklefield Lane, Rawdon, Leeds LS19 6AX

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ASH Associates specialise in the recruitment of real-time Software Engineers, Windows™ Developers and Programmers for the High/New Technology markets.

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Development environments are concentrated on Windows™ 95/NT, UNIX & MAC; software languages are C/C++, Visual C++, Visual Basic, JAVA, Embedded/ 80x86 - 68K; of real interest is OOD, MFC, TCP/IP, X-Windows, OSF/Motif, DSP etc.

We always keep a current selection of our positions on the INTERNET so call us for details on what we can do for you and see our web pages at http://www.ash-associates.com for whats NEW.

URGENT requirement for C++/Java developers for a client in Bucks Grads £20K+, experienced designers £30K-£40K

Call or Email
Ron Cook. Email: ron@ash-associates.com
James Hunt. Email: james@ash-associates.com

ASH Associates

COMPUTER RECRUITMENT CONSULTANTS
First Floor, 39 to 41 High Street
Ringwood, Hants, BH24 1AD
Email: recruit@ash-associates.com
TEL:(01425) 475480 FAX:(01425) 480807

Telephone
01425 475480
Fax
01425 480807

ESS

The Company

Our client is a software house focused on developing innovative messaging & business intelligence software for the worldwide corporate market. The company was established in May 1996, born out of its sister company, a market leader in IT solutions for the global shipping and logistics industries.

Their core product is a packaged tool that sits alongside any OLTP system looking for business exceptions, like debtors due over a certain period of time. If any are found, the product sends an electronic mail out to the relevant users alerting them of the event that has just occurred, enabling business events to be monitored by easily set 'Alarm Bells'. It is pioneering the concept of automated messaging.

Our client has a high quality product, supported by a young, dynamic, creative and experienced team - both technically and commercially. With offices in both California and Southern England the future is set for tremendous growth.

The People

All positions will offer the opportunities, challenges and the rewards commensurate with a company planning to double in size over the coming months. You will be committed to total quality, excellence and success at both an individual and company level. You will be self sufficient and enjoy being a pro-active team member. You excel in a fast moving, dynamic environment.

The Vacancies

- **Developers**

Background in Object Oriented development using **Visual Basic** plus experience of some of the following:
Com / DCOM, Corba, ActiveX, ASP, Java, Internet related technologies. You will be a **VB GURU** and it is unlikely that someone with less than 2 years commercial experience will be suitable.

- **Test Manager / QA**

Initially a hands on role but you have the desire to grow the role and the team to keep pace with this demanding function. You will be tasked with responsibility for internal quality and test issues.

- **Technical Author**

Ideally proficient using **Robohelp** otherwise a good knowledge of another help authoring tool. Experience in producing **.hlp**, **.html** and **.pdf** files is essential. You will have responsibility for document management within the company.

If you wish to join a company proud in their success and products please contact Grant Whelan at your earliest convenience or e-mail your CV to grant.whelan@esslimited.com.

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Telephone 0181 977 4848 Fax: 0181 977 7979

CAREERS & CONTRACTS

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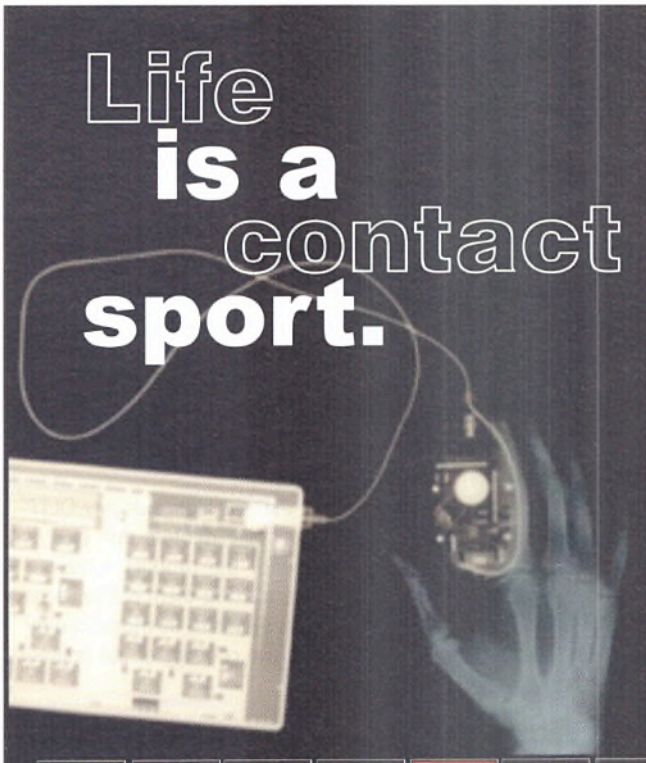

Analyst Programmer
London **£45,000**
The successful applicant will take a leading role in the design, development and support of key infrastructure systems within this leading financial organisation. You will need to have an in-depth knowledge of software development using C/C++, Unix and one modern RDBMS. Team leadership and management experience advantageous. This is an exceptional opportunity to enhance your technical skills further in a client-facing role.
Ref: 732/4 Email: ian.dykes@haymarket.com

C/C++ Programmer
City **to £45,000+bonus+benefits**
Technical Consultants to join finance and banking team within this growing software house. You will be working on a variety of leading edge projects. You will need sound Unix along with either C or C++ experience. Sybase is advatageous, but training will be given for the right candidate. Casual dress code, flexitime and excellent career prospects.
Ref: 90947/1 Email: leigh.carrick.moore@haymarket.com

VB/SQL Developer
City **c £30,000 + benefits**
Developers required to work on leading edge applications for a financial software company. Candidates must have solid Visual Basic or SQL Server experience, projects are likely to be on a wide variety of applications. They must also be prepared to work on client sites as part of a team or as an individual.
Ref: 51110/1 Email: simon.vickers@haymarket.com

Snr Project Programmer/Developer
London **£30,000+benefits**
This young & innovative company of software & communications professionals are seeking a programmer who can fulfil the role of Senior Programmer on their web based team. You should have at least 12 months experience in building commercial Web sites also an expert in developing solutions using some or all of the following: ASP, HTML, MS Access, SSL, PGP, Java, VBScript, JavaScript, Perl, PerlScript.
Ref: 91274/2 Email: tony.georgiou@haymarket.com

Development Manager
London **£ Negotiable + Benefits**
Experienced development manager required for a London based consultancy, you should have at least 10 years in the IT industry, with at least 5 years in an infrastructure development role. MS-WINDOWS NT and MS-EXCHANGE (a track record of rolling out this technology is essential). A minimum 2 years experience of programming in Visual Basic with MS-Access or SQL-Server. Proven ability (minimum 2 years) in leadership and management of a small, expert team. Good verbal, presentational and written communications skills.
Ref: 90822/11 Email: chris.isaacs@haymarket.com

Applications Programmer
West Sussex **£30,000+benefits+car.**
Joining a very friendly team in the company's main development centre, candidates will need to be experienced in Lotus Notes programming. You will be offered full training in Lotus and also into other areas with the involvement in full project lifecycle. The right candidate will be selected to take charge of the existing team. The company needs enthusiastic 'can-doers' to join this very modern and rapidly growing technology centre.
Ref: 94935/7 Email: katherine.smith@haymarket.com

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Senior Software Implementor **£25k +Bens**

Visual C++ (1-2 years), with MFC, Visual Basic, SQL Server 6.5. Project Manage from pre-sales to customer sing off, Install and configure Software, Ability to do minor hardware work install cards etc, Knowledge of NT4, Customer facing skills, Knowledge of document imaging would be useful.

Hants **RM465**

Software Engineer **£25k+Bens**

Large defence Systems Company are looking for Software Engineers to work on an ever-expanding range of new products. You will have experience in the following, Real-time Embedded systems, Interrupt handlers and device drivers, C C++, OOA, OOD, VxWorks or QNX MIL STD 2167 or similar WordPerfect 6.0 or Word 7.0. This position offers good prospects for the right candidate.

Surrey **RM469**

Embedded Software Engineer **£Neg +Bens**

Gas detection, space monitoring equipment. Must have proven design record in the digital design and proofing of real-time embedded systems, experience and familiarity in real time program development from requirement specification to acceptance testing, preferably experience with, Intel microcontrollers/processors, memory, PLDs, peripheral devices-particularly analogue-to-digital and digital-to-analogue converters.

Herts **RM439**

Software Design Engineer **£Neg +Bens**

Position involves both GUI and low level device driver type programming. Experience of NT device drivers is desirable, 2-3 years Microsoft Visual C++, electronics and telecomms knowledge would be useful, proven ability to implement standard windows functions e.g. point and click, printing etc., VxD and DLL experience, knowledge of migration from windows 95 to NT.

Hants **RM419**

Software QA Engineer **£18-22k+Bens**

HNC / BSc or equivalent, 2yrs experience in a similar position with proven abilities to run a team, OOA / OOD, Experience of suitable testing tool's and product development, ISO9000 / structured projects, internal Auditing techniques.test strategy to be adopted by all development projects. Carry out all internal audits as part of a QA group. Planning, motivation and monitoring activities of test engineers.

Hants **RM407**

Software Sales **£18 - £24K + Bens**

Required for dynamic software training organisation is a sales professional. The preferred background will consist of previous experience within this market sector and will include the ability to target PC manufacturers.

Sussex **RM468**

For further details of the vacancies outlined above or any other positions that are currently available please call Robin or Hannah

C++ OOD MFC UNIX ORACLE

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Towcester, Northants
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Use your experience of Designer/Developer 2000, Oracle Forms 4.5, PL/SQL and UNIX or NT to provide maintenance, support and development for this prestigious consultancy. Reports 2.5 and Pro*C preferred. Excellent package includes merit bonus, 25 days holiday, pension, private health and other benefits. Ref: E12/1

C/C++ or Java, OOD and Network Technologies
Herts/Bucks border ***up to £40,000 + bens***

Use your programming experience to design and develop Network Application Monitoring software. Knowledge of networking technologies and protocols such as SNMP, IP and routers essential. In addition you are a team player with a flexible attitude. Ref: E12/2

Unix/C Programmers
Oxford ***£22-£30,000 + excellent benefits***

A world leader in its field, this software company seeks Unix Programmers with excellent C skills. An understanding of low-level Unix programming and experience of developing and maintaining commercial software essential. Any Solaris, AIX, HP-UX and Digital Unix an advantage. Ref: E12/3

Visual Basic 4/5 - SQL Server
London with travel ***£25-£35,000***

Leading financially orientated software house, require talented developers to work on exciting OO development projects. This company offers interesting work on Visual Basic 4 or 5 with the opportunity to move into SQL Server. Ref: E12/4

Project Leader - C++, MFC, OOD
Hampshire ***up to £35,000***

Multi-disciplinary technical project leadership experience plus knowledge of the Product Development process and ISO9000 required along with some of C++, MFC, OLE, OOD, GUI, Java, client/server software for this exciting leading edge software company. Ref: E12/5

Software Engineers - C++
Hampshire ***£20-£35,000***

At least 1 year C++ experience plus some of GUI, UNIX, OOD and supervisory experience for the more senior positions needed for this exciting innovative company in rural Hampshire. Ref:E12/6

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Marshall-Wilkins
A DIAGONAL PLC COMPANY

Visual Basic Developer
West End £20-30K

Centaur Communications is seeking to fill a key post for a major new Web site.

You will be a crucial part of a small team working on a cornerstone of our online strategy.

You will need to have a solid programming background and a good working knowledge of Visual Basic.

We are offering a great working environment and an opportunity to get skilled up in bleeding-edge Web technology.

Please get in touch: we need you.

Send your CV to:
Danny Sofer
The MAD Project
Centaur Communications
St Giles House
50 Poland Street
London W1V 4AX
Or drop me a line at dsofer@centaur.co.uk

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Freebie of the month

Forget JavaWater! Now you can be refreshed by the cool, clean taste and amazing power of Windows! Introducing Eau de Windows, the wettest thing to come out of Redmond since Microsoft Bob. Eau de Windows purifies you *and* your code. It cleans you out, fills you up, and leaves you ready for more. Definitely not enhanced with any psychotropic drugs to make you want to believe that Windows 2000 is a good name for NT, Eau de Windows is the power drink for power programmers. Jolt may give you caffeine, but only Eau de Windows can give you the full blast of 300 grams of MFC in every litre! Soon you'll be actually understanding aggregation – even templates!

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So for clarity, purity and good clean wholesome family Ivalues, drink Eau de Windows. Approved by Bill for *you*.

(Eau de Windows is bottled at Redmond from Lake Bill; may contain rooster by-products.)

Blast from the past

As the attentive reader will have noticed, last month we made mention of one of dashing ex-ex-editor Will Watts' more embarrassing feats of failed prognostication. So this month we thought it was only fair that we did the same for one of EXE's other great editors past. We present here, then, a selection of choice foot-in-mouth comments from only slightly-less dashing ex-editor (1988-1990), Mr Robert Schifreen.

'My personal feeling is that the days of the graphics-dedicated machine are numbered. IBM, after all, has the 8514 graphics card for the PC, and it won't be long until 486-based PCs with VGA/2 can do as much as workstations can do today, and more.' – .EXE, *April 1989*

Somehow, we don't think the boys at Pixar, Foundation Imaging, or Framestore would agree.

'So, I thought, isn't it about time that some enterprising little software house comes up with a generic INSTALL program that every software company could include on their disks? This generic program could be made as shareware, or licensed to companies for a small fee.' – .EXE, *May 1989*

Well, technically he was right, but from a financial point of view, would it not have been better if Robert had done this himself (or at least patented the idea) rather than leaving it to InstallShield to make millions? Doh!

'The way I see things is this. MCA is a technically superior way of linking the components of a personal computer. However, with the current state of technology, the standard AT bus will suffice. Two or three years from now, though, MCA will come into its own.' – .EXE, *June 1989*

This was a semi-finalist in 'Joke of the Year '89' but was pipped at the post by Bill Gates' famous 'We believe OS/2 is the operating system for the 90's' gag. Good try, though.

We could go on, but it would be cruel...

Monkey business

A tourist walks into a pet shop in Silicon Valley, and is browsing round the cages on display. While he's there, another customer walks in and says to the shopkeeper, 'I'll have a C monkey, please'. The shopkeeper nods, goes over to a cage at the side of the shop, and takes out a monkey. He fits a collar and leash and hands it to the customer, saying 'That'll be $5000'. The customer pays and walks out with his monkey.

Startled, the tourist goes over to the shopkeeper.

'That was a very expensive monkey – most of them are only a few hundred dollars. Why did it cost so much?'

'Ah, that monkey can program in C – very fast, tight code, no bugs, well worth the money'. The tourist looks at the other monkeys.

'That one's even more expensive – $10,000! What does it do?'.

'Oh, that one's a C++ monkey; it can manage object oriented programming, Visual C++, even some Java. All the really useful stuff'.

The tourist looks round for a little longer and sees a third monkey in a cage on its own. The price tag round its neck says $50,000.

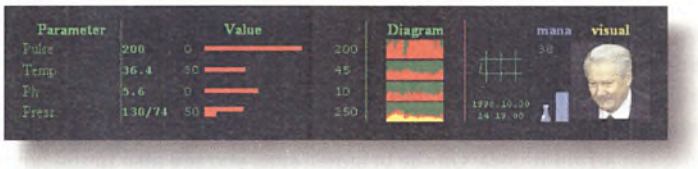
'That one costs more than all the others put together! What on earth does it do?' said the tourist.

'Well,' said the shopkeeper, 'I don't know if it *does* anything, but it says it's a contractor.'

Thanks again to Mark Cole and Dave Dorrell for supplying us with this and other gems.

And finally

Word reaches us of 'Hospital Online', a Russian website featuring a Tamagotchi-like virtual President Yeltsin (*http://hospital.rulez.net/*). Yeltsin, as in real life, is rather ill, and visitors to the site have to care for him by suggesting courses of treatment. You see the effects your suggestions have by watching on-screen as his vital signs go up and down, and his appearance becomes progressively more healthy or more haggard.



We think this is a splendid idea, and has the potential for many similar applications. How about the Clinton Impeachment Monitor, offering visitors the chance to suggest new whoppers that the virtual President can tell the House Impeachment Inquiry to convince them to let him off? Or the Microsoft Trial Monitor, where visitors can advise a virtual Bill Gates on how to prove that he's really a competition-loving peaceful kind of guy who would never say boo to a goose, let alone Marc Andreesen? Hmm... perhaps not.

The bazaar view

Baffled by Red Hat and Slackware?

Confused by Gnome and KDE?

Do you not grok it?

Verity answers your burning Linux questions.

Verity, one thing I must ask before we get onto the more technical stuff. Is it 'Linux' as in 'apple-pie-sucks', or 'Linux' as in 'Neil Kinnock's'? And 'Linus' Torvalds to rhyme with 'highness', or 'Linus' to rhyme with 'sinners'?
Good grief, did you fail O-Level Finn dialect Swedish too? In the mouth of its creator, it's 'Linux' to rhyme with 'three ducks', and his name is 'Linus' to rhyme with p...

Thank you Verity, that will do. So Linus is Finnish then?
Yes, he is the world's third famous Finn, after the composer Sibelius and Papa Moomintroll of the Finn Family Moomintroll, and has thus enabled Finland to open up the gap between itself and Belgium in the world number-of-famous-people league. Poor old Belgium remains stuck with just Hercule Poirot.

And in what part of Finland does Linus live? Helsinki?
He has recently moved to a south-westerly province of Finland called California, where he works 60 hours a week on a top secret chip design project, believed to be a freeware version of the Pentium, or something.

Hmmm. That won't leave him much time to do Linux then?
Apparently he spends another 60 hours a week on Linux. On top of this he is a family man with two children. It is not clear how he finds any time at all to sleep.

And what's more his body odour is reminiscent of wild strawberries...
Shuddup. I won't have you dissing Linus. Anyway, I thought you wanted to ask some technical questions.

All right, all right, keep your penguin on. Lets check that I have this right. We are talking Unix here. Does this mean, sigh, we are back in the land of vi and grep and ls flags and shell scripts and regular expressions and command line compilers and all that?
Yes, I'm afraid it does. On the brighter side, you are also in the land where OS crashes are rare, rapid fixes are devised just for you by obliging foreigners, free utilities abound, the best-known and best-written Internet facilities in the universe are at your service, the system calls actually make some sense, and there is the satisfaction of cocking a snook at the establishment.

And of course punters will once more be helpless in our hands. Deprived of their silly GUIs, they will have to start doing as they are told, like in the good old days. And without the misery of proportional fonts, I will be able to reuse all that nice output formatting code that counts to 80 characters...
Hold your horses. Linux *does* have GUI facilities.

Oh no. Don't tell me – it's based on that frightful X library, the thing that started by confusing 'client' and 'server', baffled everybody and fragmented its market by offering a pointless choice of window managers, and then cemented its awfulness by being impossible to program.
Well, yes it is based on X...

Palpitating pixmaps! And there are several competing and incompatible versions of it, right? And you have to type in the serial number of the processor chip on your video card, expressed in octal, to get it working?
Ok, the GUI stuff could do with a little cleaning up. But the boys on the Net will see to it. Meanwhile you can stick it on a 0.02 HB machine...

'Scuse me. What means '0.02 HB'? How do pencils come into this Linux thing?
Sorry. A machine rated at 1/50th of a Honeyball, the new SI unit of PC swank. A 1.0 HB machine is technically defined as a four processor Pent II with a gig of RAM, so a 0.02 HB machine is something like that old 66 MHz 486 with the blurry monitor and cigarette burn on the keyboard that lives underneath the broken network card shelf.

You are claiming that Linux will work well on this sort of machine?
Absolutely. To install Linux is to remember the days when 32 MB of RAM was more than you'd ever need, when a 100 MB hard disk was...

Yes, yes, I get the picture. And where does Java fit into this? I thought that was going to be the saviour of the Unix mob...
Sun's ongoing attempt to emulate the triumph of UCSD Pascal? Leaving aside the legal wrangling, how many worthwhile, *working* Java applications have you seen in the wild? Exactly. Java is still running along the ground flapping its arms, and it is getting rather short of runway...

Verity, you political old battle-axe. I didn't see you as a Linux-head. I sense you are impressed. How come?
Various recent experiences, but mostly I was converted by a lucid and convincing pair of leaked Microsoft white papers, the so-called Halloween Documents, which you should certainly read for yourself if you have not yet got around to it (see *http://www.opensource.org/halloween2.html*). I found some of the phrases in them very striking, eg '[the combination of] Linux / [Netscape] Navigator ran at least 30-40% faster [than NT / IE4]' and 'Linux's (real and perceived) virtues over Windows NT include: Customization, Availability/Reliability... Scalability/Performance [and] Interoperability'.

Microsoft, I feel, is peculiarly well placed to make such assessments. Normally I treat their statements with some scepticism, but if they assure me that Linux is better than NT, I am prepared to take their word for it.

So what bird will Mr Gates be eating for Christmas?
Family-sized microwave crow.

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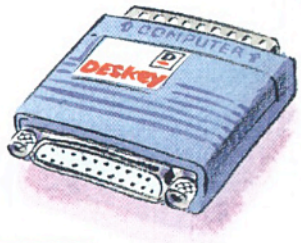

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