THE SOFTWARE DEVELOPERS' MAGAZINE

EXE

AUGUST 1999

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from the inside out

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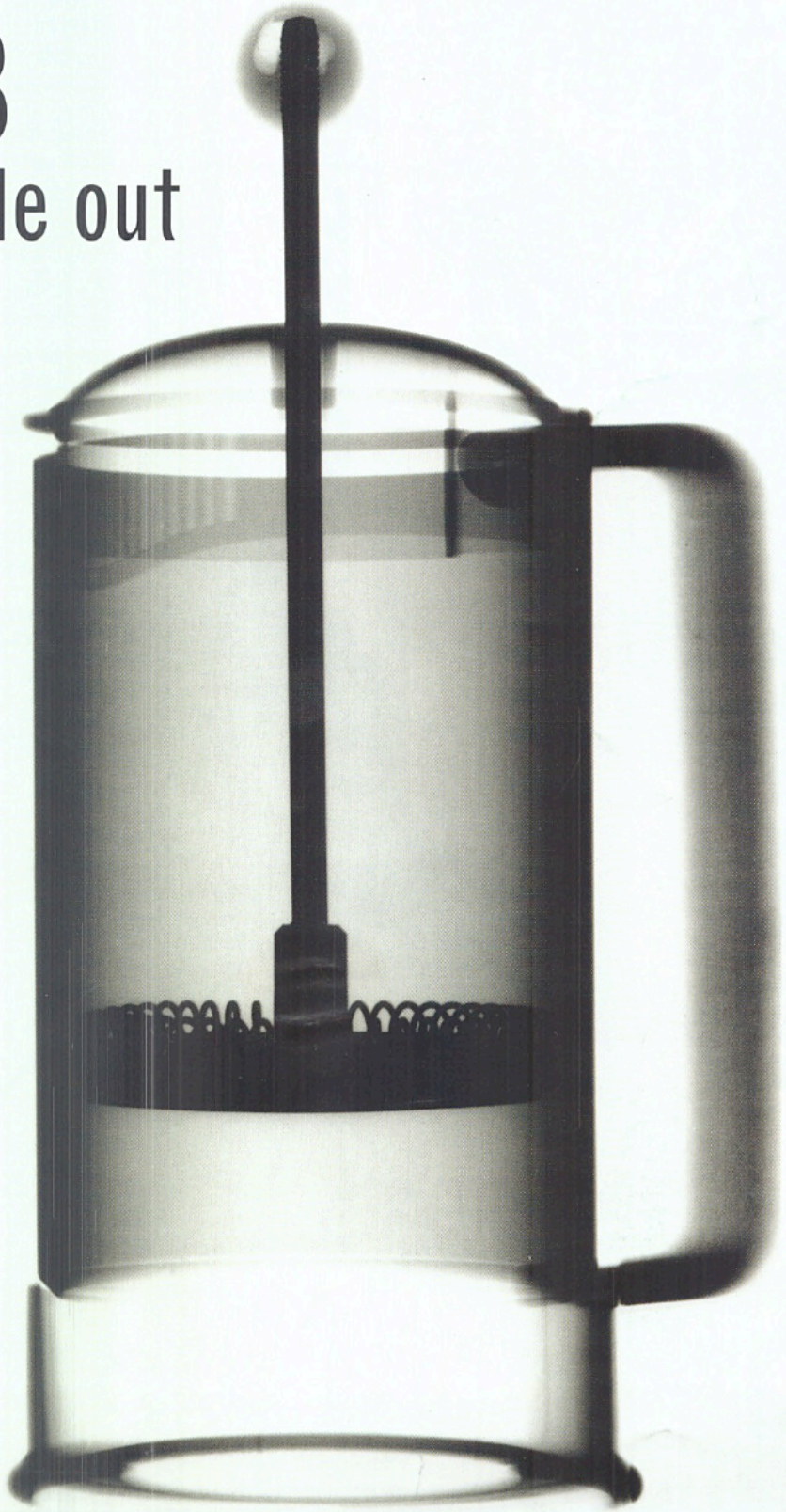
kills bugs
dead

Rebasing
DLLs

Java RMI
by example

Scripts
grow in
scale

Contractors
friend or foe?



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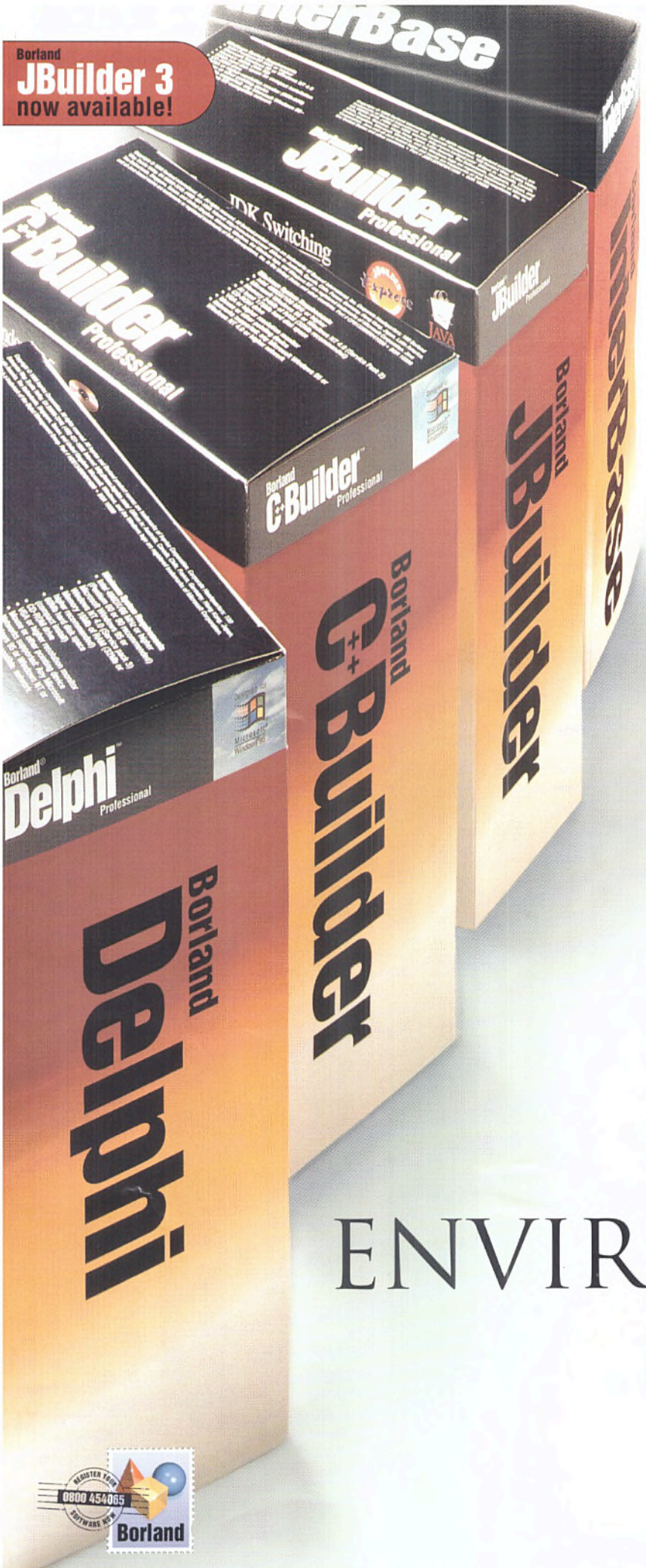

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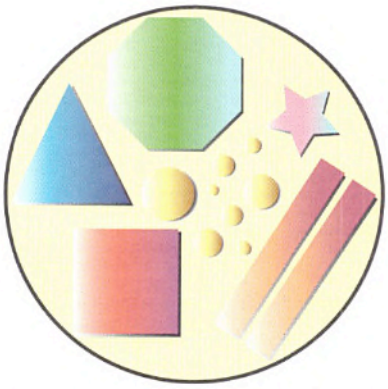

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Hedging your bets

Two obvious marketing strategies are to go after a large share of a small niche market or a small share of a much larger market.

Considering the time it takes to define a product from both a technical and a marketing point of view, and then implement these decisions, there is a need to predict the future, especially what the dominant platform will be. For quite a few years it has been obvious that if you want to attract a large number of users, you'd better target Windows in one flavour or another. According to our last Salary Survey (EXE, April 1999) you have followed that route, since 88% of you said that you are developing for Windows. That doesn't mean the death of other platforms: Unix attracted 34% of responses and DOS still had 25% developing for it.

Going back to nearly ten years ago, targeting Windows was far from an obvious choice. In May 1990, Will Watts, then editor of EXE, wrote the following words (which have since haunted him): 'Windows, although it has enjoyed more success recently, and is about to be upgraded again, has always had a slight smell of death to it: Windows is, after all sitting on top of MS-DOS, and it has been drilled into us that MS-DOS is doomed. [...] And so comes the dismal realisation. It's not that GUI hasn't really happened for PC-class machines; it is the feeling that it is never going to happen; we are always going to have factions of users backing diverse systems, with the majority using text-based systems.'

We have quoted these very same words recently in our humour column (*Ctrl-Break*, November 1998) but, lets be honest, who at that time was ready to bank on the Windows platform? The likelihood of a flop was great. Remember how underpowered PCs were at the time? The difficulty of deciding which platform to target has been compounded by the increasing swiftness of product lifecycles. Time was not the same when some of us were developing for mainframes – it shortened with the arrival of PCs and now we're talking about 'Internet time'.

There has been a move from thinking purely in PC terms to the Web, but even this evolution is still firmly rooted in the PC world. The current approach is to have some kind of backend, which might well be some legacy system, some middleware (ideally an application server), and a browser – which is too often thought of as a PC.

The days of Windows as the dominant platform are numbered.

I believe that the days of Windows as the dominant platform are numbered. But if you expect me to start a eulogy of Linux, you've missed the point. Linux is already a significant platform, but what I have in mind is a more radical change. The next end-user terminal will be an embedded device, something like a smartphone and there will be two major platforms to target for software developers: one is the device itself and the other is the network from which services can be delivered to the device (ie the mobile telephone networks).

At a recent Epoc conference, the Symbian partners (Nokia, Ericsson, Motorola, Panasonic, and Psion) announced that they have revised their prediction of 1 billion mobile phones by 2005 to 1 billion by *2003*. Even if you take the initial prediction and apply a reality factor to it, you probably still end up with a number that dwarfs most predictions of the PC market's growth. All the requirements for this to happen are in place, ready for the first generation of products to be in the market just before Xmas.

To hedge your bets on which platform is soon likely to become dominant, you have to find out what type of applications and features you want to deliver and how. For the *what* question, the only limit is your imagination. Don't restrict your options by just thinking of straight ports of existing apps. To quote Brenda Laurel, from her book *Computers as Theatre* (updated last in 1993, ISBN 0201550601): 'The recapitulation of previous forms seems to be intrinsic to the evolution of the media as it is to the development of human individuals in the womb: human embryos have gills and tails before they assume uniquely human shape; television emulated theatre, vaudeville, radio and film. The emergence of a new medium is a dance between the evolutionary pattern of recapitulation and the force of new creative visions.' As for the *how*, your app can live in the smartphone or in the network. There is a broad consensus from smartphone manufacturers for the device to run Java, the Wireless Application Protocol (WAP), and Bluetooth. That's what you can rely upon.

As a reality check, during a conversation last month with Laurent Séraphin, European Product Manager for Enterprise Products at Inprise, he admitted the inclusion of Corba support in smartphones as likely, and indicated that work and negotiation for inclusion of a small footprint version of VisiBroker is in the works. Since it is not yet part of an announced strategy he wouldn't be more precise, but it shows that this vision is shared by some of the traditional PC development tool vendors. And worldwide mobile phone networks are announcing support for WAP. One of the latest announcement in the UK is from Orange, which promises a WAP phone and WAP services for the fourth quarter of this year.

As you decide how to hedge your bets, remember the following classical pitfall described by Brenda Laurel: 'All new media begin with visions – fantasies, desires, and ideas about new kinds of experiences that people might have. As development progresses, these visions can be overshadowed by the more immediate concerns of technology development. Too often, the technological perspective comes to dominate not only the process of development, but also the shape of the emerging medium itself. The visionary impulse fades away as technological progress becomes the sole focus. Some of the powers that a medium might have had are lost in the rush to find near-term solutions.' If you haven't done so yet, investigate this new platform. If you want to be an early adopter, start developing for it today. And in all cases keep your mind open.

David Mery

Patricia Deardorff

JaCC '99 – conference preview

High quality technical content delivered in a friendly format – that's the promise of this Autumn's conference. Organised by ACCU – the Association of C and C++ Users – together with EXE, JaCC (Java, C and C++) will bring together some of the most respected names in the business. The conference runs for four days, from Wednesday 15 September to Saturday 18 September, at the Oxford Union – the oldest and arguably the most famous debating society in the world.

ACCU has put together 10 distinct tracks and more than 20 speakers, all acknowledged experts in their fields. Jim Coplien, Andy Koenig, Barbara Moo and Nigel Warren head the bill, with home-grown gurus like Kevlin Henney, Iain Barclay, and Eric Leach (all past or present EXE contributors) filling out the programme. Tracks that will be covered include C++, Patterns, Java, Embedded programming, Games programming, Unix, Windows, PDAs/handhelds, and Corba. Different tracks will run on different days – Wednesday is Platform Day (Unix, Windows, PDAs, Corba), Thursday and Friday are general days (Patterns, Java, C++, Games, and Embedded programming), while Saturday is Enthusiast Day featuring a Brains Trust in the morning, and a participatory debate in the afternoon.

Agenda

The general format for JaCC is to have mornings of high quality themed talks and afternoons providing a wide choice of hands-on workshops and break-out sessions.

The conference kicks off on Wednesday with the fundamental issues of platforms and independence. Sean Baker of Iona gives the keynote, *OS-Specific Development*. In the sessions that follow, Iain Barclay, founder and webmaster of PDA specialists RoadCoders, covers the increasingly important area of PDAs; Eric Leach, long-time OMG stalwart, will provide coverage of Corba and the management of distributed objects; Ken Jackson and speakers from Microsoft look at Windows development; plus an extensive track on Unix/Linux.

On Thursday and Friday the language and techniques streams begin. The keynote for Thursday, *Patterns for all*, is given by Jim Coplien who is a member of the Software Production Research Department at Bell Laboratories. Coplien shares the Patterns track with Kevlin Henney, a Principal Technologist for QA Training. The C++ track is in the expert hands of Andy Koenig – of AT&T's Shannon Labs – and Barbara Moo, co-authors of the well-known book *Ruminations on C++*. Nigel Warren, Senior Java Consultant at Hitachi and author of *Java In Practice*, shares his Java wisdom. Meanwhile, Jon Jagger of QA Training considers programming for non-experts.

Friday features the Games track, under the firm control of games guru Jez Sherlock, and a stream on Embedded Programming is led by Chris Hills of Hitex. The C++ track continues in the capable hands of Andy Koenig and Barbara Moo, and Jon Jagger continues his exploration of programming for non-experts.

Saturday is the day for enthusiasts. Following on from a keynote given by Kevlin Henney, the advantages and disadvantages of C, C++, and Java will be examined in depth. Finally, JaCC '99 concludes with a debate to set the hackers versus the professionals: *Good software development can only be done in a standardised language.*

Throughout the week there will be workshops, hands-on sessions and breakouts in the afternoons. These will not only let you interact directly with the speakers, but also allow you to explore the other tracks if you didn't get chance in the morning.

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JaCC '99 is an important event that no software developer can afford to miss. With ACCU and EXE working together, a superior quality of technical sessions is guaranteed. Plus, with generous discounts for ACCU members and EXE subscribers, and even more savings if you book early, coming to JaCC will not break the bank. See you in Oxford!

Conference schedule

Platform Day
Wednesday, September 15
Keynote: OS specific development, Sean Baker
am: tracks – Unix, Windows, PDAs, and Corba
pm: tracks & workshops

Languages and Techniques I
Thursday, September 16
Keynote: Patterns for all, Jim Coplien
am: tracks – Patterns, C++, Java, and Other
pm: tracks & workshops

Languages and Techniques II
Friday, September 17
Keynote: Programming traps and pitfalls, Andy Koenig
am: tracks – Games, C++, Embedded Programming, and Other
pm: tracks & workshops

Enthusiast Day
Saturday, September 18
Keynote: Design – concepts and practices, Kevlin Henney
am: Brains Trust on the dis/advantages of C, C++, and Java.
pm: debate – 'Good software development can only be done in a standardised language'.

Pricing information

Daily rates	Early bird rate	Standard rate
EXE subscribers & ACCU members*	£75 +VAT (£88.12)	£95 +VAT (£111.62)
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Student	£50 +VAT (£58.75)	£50 +VAT (£58.75)
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3 Days rate (Fourth day free)		
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Non EXE/ACCU	£285 +VAT (£334.87)	£345 +VAT (£405.37)
Student	£150 +VAT (£176.25)	£150 +VAT (£176.25)

There is an additional 10% discount for bookings of over 5 delegates.
*Note that ACCU members include the category of Corporate ACCU members.

Booking information

Telephone:	Jenny Lowe on 0171 970 4772 (fax: 0171 970 4797)
Email:	jacc@exe.co.uk (web: http://www.exe.co.uk/jacc/)
Post:	Jenny Lowe, Event Manager, Centaur Events, 50 Poland Street, London W1V 4AX.

Developing server-side SQL code

SQL-Programmer IX is a development environment for database application developers working on server-side SQL code, such as stored procedures, functions, and triggers. It includes a SQL debugger for Microsoft SQL Server, and its drag-and-drop Virtual Editor lets you revise, and test SQL code without affecting the original code on the database server. The optional SQL Documentor module automatically documents your work and can produce over 60 reports detailing the server environment.

Version IX sees execution profiling of stored procedures and triggers for SQL Server 7.0. This provides details at a statement level, such as execution duration, number of reads, number of writes, and execution flow. There is also an 'ExecutionTree' profiling report with details for each statement.

As well as working with Microsoft SQL Server 7.0 (with retro-active support for version 6.5), it provides a development environment for Oracle PL/SQL (a PL/SQL debugger is available) and for Sybase Transact-SQL programmers. It includes direct interfaces to Microsoft SourceSafe, Intersolv PVCS, and MKS Source Integrity for change management. Pricing starts at $299 and a demonstration copy is available from the Web.

w www.sfi-software.com

Windows 2000 gets tougher

Microsoft's new mantra for Windows 2000 is stability and reliability, it seems. The company will be taking a hard line on backwards compatibility with NT 4.0, declaring that while every effort will be made to ensure that NT 4.0 apps run on Windows 2000, this cannot be at the expense of system reliability. In such cases, applications that break will simply have to be rewritten. The push for reliability centres on three areas: side-by-side DLL versioning to avoid 'DLL Hell', system file protection, and much tougher requirements for the 'Designed for Windows 2000' logo program.

The side-by-side versioning capabilities of Windows 2000 extend to new and old apps alike; for old apps, it's possible to force the system to ignore any absolute path specified in a `LoadLibrary` call or COM object reference and use instead a DLL in the local application directory, while for new applications you must register the libraries on a per-version basis in the Registry, and the system keeps track of which applications installed which versions.

System file protection applies to a set list of files specified by Microsoft – to which developers can add if they wish – which are digitally 'signed', and includes all important system DLLs and controls. Any attempt to overwrite these files by users or installers – which frequently replace shared system files without bothering to check whether their version is newer – will prompt the system to restore them immediately from a local cache or from the installation media. This process is transparent to users, in order to avoid causing installation routines to fail. In future, only updates issued by the Windows 2000 development team or authorised developers will be able to replace or upgrade system files.

The new logo requirements are quite stringent, requiring developers to implement side-by-side versioning and use the Windows Installer service to enable self-repair functions. Microsoft intends the logo to become a genuine seal of quality and will not permit any exemptions from the requirements, especially for its own product teams (several Microsoft products, including BackOffice Server 4.5, SQL Server 7.0, and Visual Studio 6.0, will have to wait until their next versions to get the logo).

w support.microsoft.com/support/win2000dev/guide.asp

A Java wave

It might not be the final Java tsunami, but IBM has announced the next wave of its application development tools for helping make e-business a reality. As well as beta versions of VisualAge for Java v3.0 and WebSphere Studio v3.0, there is a new version of SanFrancisco, v1.4, and a roadmap for migrating SanFrancisco to Enterprise JavaBeans (EJBs).

SanFrancisco Application Business Components are pre-built, reusable components for developers to create Java-based e-business apps. With version 1.4, IBM is beginning the migration plan to convert such components to EJBs. This will enable SanFrancisco apps to run on any EJB server, including its own WebSphere Application Server. The migration is part of a wider plan to provide a unified, EJB-based programming model across IBM's Application Framework for e-business. Version 1.4 sees new GUI beans, schema mapping enhancements, and new database and platform support.

The beta version of VisualAge for Java v3.0 sees support for SQLJ, compiler optimisations, improved integration with WebSphere Server and Studio, and support for deployment to Solaris. A technical preview of VisualAge for Java with support for Java 2 has also been released.

w www.software.ibm.com

Two systems from Segue Software for testing and monitoring **Corba** components. **SilkPilot 1.2** provides unit testing of distributed objects and **SilkObserver** 2.0 provides monitoring capabilities: communication and parameter values between objects can be observed, to diagnose problems and trace messages.

www.segue.com

Pervasive has announced the **Tango 2000** Web development system. The visual development environment includes full COM and **JavaBeans** support. Tango Class Files allow you to save Tango code as objects for reuse via drag and drop, and Tango Web Analyser is a suite of components for monitoring website activity.

www.pervasive.com

The **GemStone/J3.0** application server supports the recently announced specification of Java 2 **Enterprise** Edition, including JavaServer Pages, the **Java** Security Architecture, and Enterprise Java-Beans. It integrates these Java elements with an all-Java ORB and an Object Transaction Monitor.

www.gemstone.com

InstallFromTheWeb (IFTW) 3.0 is a download and installation system for the **distribution** of Windows-based application via the **Internet**. It's aimed at developers who want to web-enable products for sale and distribution and for enterprises that distribute applications to internal users.

www.installshield.com/iftw/

App Dev '99 saw the UK launch of **JLOOX**, a graphics toolkit for Java 2 development. Built on the **Java2D** API, the system from **Scientific Computers** provides a high-level 100% Java API that extends the capabilities of Swing. A free evaluation is available from the Web.

www.scl.com

Sun has released the Java **TV API** specification, which is intended to bring the benefits of **Java** to the digital television market. It was developed with support from the industry – Philips, Sony, Toshiba, and LG Electronics – and will enable the development, and secure delivery, of **interactive** television content and services.
www.sun.com

The aim of **Developer Suite** 1.0 is to provide developers with all they need to build customised business **intelligence** systems. It packages the **Business Objects** full- and thin-client OLAP software together, and there is a VBA/ASP development environment.
www.businessobjects.com

W3C has recognised **HTTP/1.1** as an IETF Draft Standard. Designed to improve **Web** performance and security, its features include persistent connections, pipelining, caching, and IP address preservation. For improved of security, there is an HTTP Digest Authentication mechanism.
www.w3.org

Iris Accelerate for Java publishes high-resolution images to the Web. The beta release from TrueSpectra uses the **Java** Advanced Imaging (JAI) API to provide on-demand **image** manipulation for Java applets. It costs £2,995 for Windows 9x and NT. A Solaris version is imminent.
www.truespectra.com

Intara's **Foundation** 3.0 is a software reliability product aiming to provide a fault tolerance solution for **Visual Basic**. Its error handling accommodates component-based, tiered, and distributed architectures. Going beyond 'crash-proofing' applications, it provides a **transaction**-based error recovery framework. It costs $295.
www.intara.com

Turn up, log on, pig out at TechEd '99

This year's TechEd – held for the first time in Amsterdam after a prolonged stint in Nice – was a more relaxed affair than last year's rather hectic event. This probably had something to do with the venue, the gigantic RAI Centre, which makes Nice's Acropolis look like a small, cramped bedsit by comparison. If the corridors and hallways seemed less busy, it was not because of a lack of attendees (about 6,000) – Microsoft is claiming that up to 1,000 extra delegates turned up this time round – or a lack of interest in the sessions. Despite the larger rooms available, some of the more popular sessions were literally full to bursting. The big theme this year was – unsurprisingly – Windows 2000 and its associated new technologies, although other platforms such as CE and Embedded NT got a look in.

Morning keynotes (about Windows 2000 and XML) from Paul Maritz and James Utzschneider – the BizTalk supremo at Microsoft – were well attended, despite the horrifically early hour. Many delegates were kept functioning by visits to regularly placed tables of free food and soft drinks that were kept well-stocked throughout the week.

The TechEd Network has been a feature of the last few years, providing PCs for delegates to use to send and receive email, browse the Web, or view event information. This year saw the introduction of the TechEd Digital Nervous System, running entirely on Windows 2000 Beta 3, and much improved it was too. Using the system it was possible to see exactly which sessions were on and where (including a hugely useful 'map it' function, which showed exactly where in the vast RAI Centre your chosen session was), or to set up a personal schedule of sessions and print out your own timetable. The system also took advantage of new functionality in the forthcoming 'Platinum' release of Exchange server to set up Usenet-like discussion groups which drew a lot of participation and allowed delegates to link up with like-minded colleagues. Bearing in mind this was running on mostly beta software, it was remarkably stable.

Perhaps the biggest disappointment at TechEd '99 was the monumental cock-up over the planned three-part Introduction to XML track on the first day of the conference. Huge numbers of delegates turned up to these sessions to find out that they had been cancelled when the speaker missed his plane from the US. When it became clear just how big the interest was in the technology, Microsoft hastily tried to organise the sessions at another time, but was unable to get the original speaker back. The end result was that many people missed out on these talks. The controversy was such that Microsoft UK, and probably several other of the European subsidiaries, are going to organise special XML training days for TechEd attendees only.

The venue for next year's event has not been officially announced, but it seems likely that TechEd 2000 will stay in Amsterdam. Meanwhile, for those of you who didn't go but wished you had, there's a host of information from both TechEd US and TechEd Europe available on the MSDN website.
w msdn.microsoft.com

All quiet on the tools front

In contrast to the talkative Windows 2000 team, the Developer Tools people at TechEd '99 had little to say about new products. Visual Studio 7.0 is still some way off, far enough at least that no-one is prepared to say much about it publicly other than that it will finally integrate all the tools under one single IDE. But then they said that last time, too.

The message from Greg DeMichillie and Tony Goodhew, both of the Visual C++ development team at Redmond, was that e-commerce – and in particular, building your business logic with Visual C++ – is hot.

To this end Microsoft has recently put out the Visual C++ E-Commerce Solutions Kit, a CD with tutorials and samples aimed at showing developers how to code e-commerce the Microsoft way.

Asked about Windows 2000 support in the tools, DeMichillie was at pains to point out that, as most of the changes are implemented at the API level, a simple upgrade of the Platform SDK is all that is needed to turn Visual Studio into a fully Windows 2000-ready development suite.
w www.microsoft.com/visualc

CE the future

Windows CE was another hot topic at TechEd 99, with several sessions dedicated to helping Win32 developers move smoothly to the CE platform. Much emphasis was placed on the UI and API differences between CE and desktop Windows. Larry Roof of CE specialists Tonked led several sessions including one looking at UI design issues and suggesting some unusual approaches to overcoming CE devices' lack of screen real-estate, including a strange-looking scrolling dialog box. The number of delegates attending these sessions, and carrying Windows CE devices around with them, seems to suggest a strong interest in the platform.
w www.microsoft.com/windowsce

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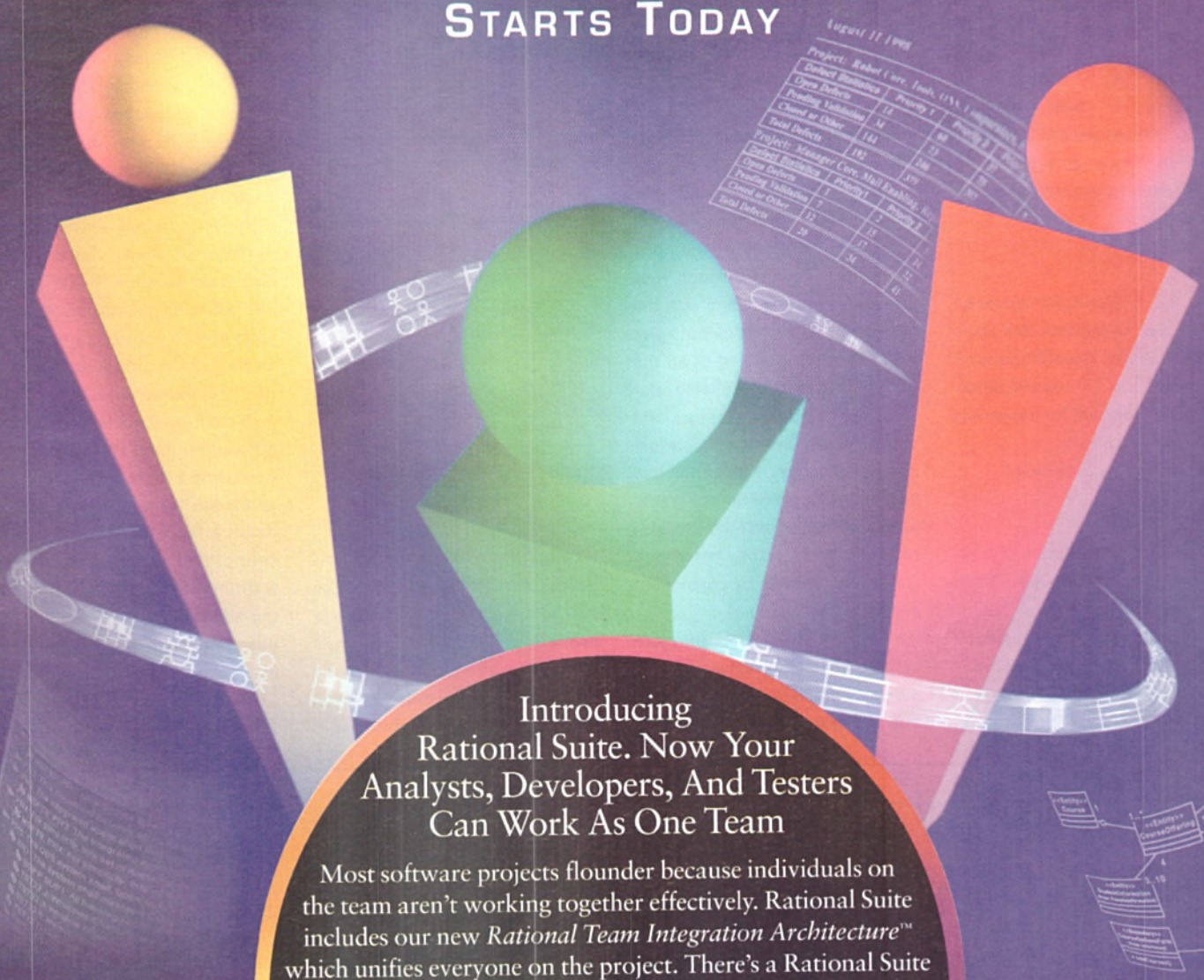

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Getting a handle on your code

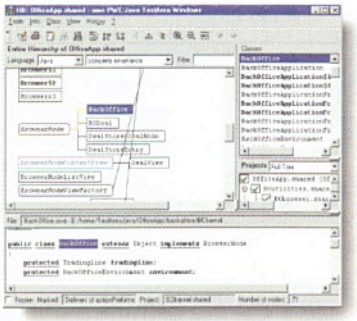
The Unify **eWave Engine** is a Java application **server** built specifically for e-commerce apps and web portal sites. It's the first product of the **Unify** eWave family to be introduced.
www.unify.com

VisualWorks Non-Commercial 3.1 is to be distributed with Red Hat's Linux 6.0 release. VisualWorks is an extensible **Smalltalk**-based development environment for networked business applications.
www.objectshare.com/vwnc/

Members of the Institution of Analysts and Programmers (**IAP**) can participate in a Professional **Indemnity** Insurance scheme, arranged by Blackmore Professional Risks. **Premiums** start at £270 per annum.
www.iap.org.uk

TakeFive has released Sniff+J 3.1, a Java version of Sniff+. This is a tool that doesn't fit easily into traditional categories (TakeFive calls it a Source Code Engineering tool). It resembles a multi-pane browser but it offers more than just code navigation. It goes through your code and analyses it, and with the information gathered it helps to give a better understanding of all the code's intricacies. Visualising relationships between classes and objects at any level of detail is just a few clicks away. Navigation can be hierarchical (inheritance graph, abstract classes, relatives, declarations) or by cross-reference (refers-to, referred-by, component analysis, interfaces).

The larger the project, the more impressive it is (TakeFive claims it supports projects of over 1 million line of code). A fuzzy parser does the code analysis, hence Sniff+ can walk through code which doesn't even compile. Parsers exist for C, C++, Java, Fortran, IDL, Ada, Perl,



HTML, Chill, and a few other languages. And if that's not enough, the API to integrate other parsers is public. A configuration file controls how strict the parsing should be, so it's possible to have it flag any type of non-standard or non-conformant code. The environment can integrate with most editors, compilers, debuggers, and SCM and CASE tools.

Sniff+J 3.1 generates pure Java code, it also incorporates a platform-independent GUI builder (written in Java). Support for Swing (in addition to AWT) and JNI (allowing generation of mixed Java and C++ apps) is provided as well as the automatic generation of dependencies.

Sniff+ is available on Windows NT and on most Unix platforms (including Linux). Typical pricing is £2,000 for a single floating licence (core capabilities plus support for one language) with additional language support costing about £600. It is free for the education market and for non-commercial use (with a limit of 200 files).
w www.takefive.com

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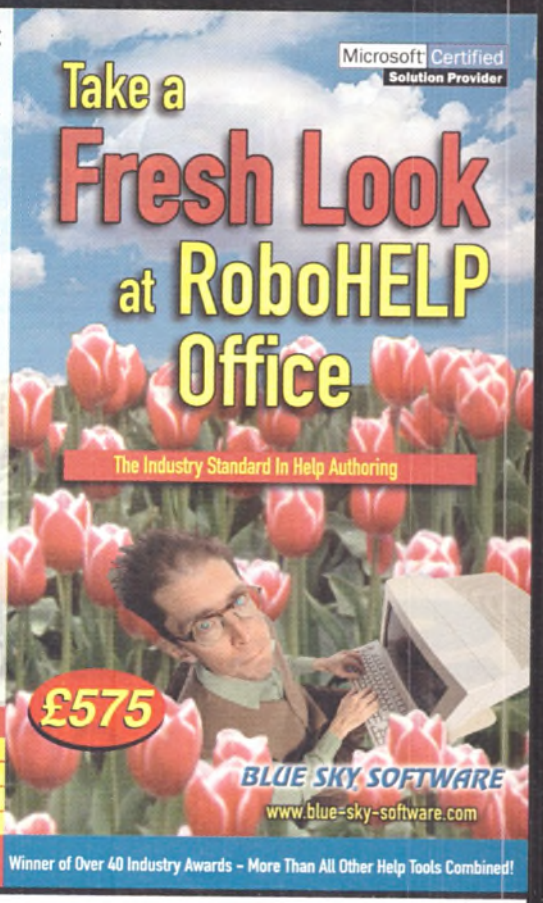

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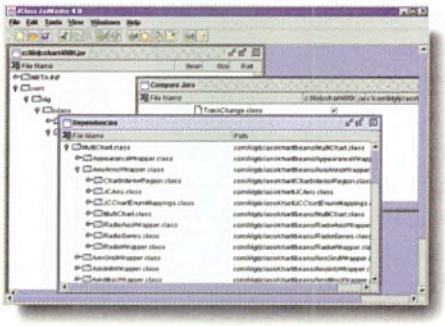
JClass 4.0 optimised for Java 2

JClass 4.0 is the latest release of KL Group's 100% Pure Java GUI components, a collection of tools for building interfaces for Java-based applications. This version has seen a rewrite of the code base to optimise support for Swing and Java 2. Support for the new 2D API has lead to new graphics capabilities, such as pattern-fills in the JClass Chart and PageLayout components. Full support for PLAF (pluggable look and feel) is also available. Another benefit of the rewrite is that some of the components are reduced in size by as much as 30% compared to the previous versions.

Version 4.0 introduces a new element, JarMaster (pictured), which is a utility enabling rapid JAR (Java ARchive) building prior to deployment. The aim is to simplify the reduction of class sizes before deployment, rather than it being a major chore. It's only included with the JClass Enterprise suite.



Other features in JClass 4.0 include greater customisation of components, support for HTML wherever text is displayed in JClass JavaBeans, and improved IDE support for the use of JavaBeans. In terms of file formats, PCL, EPS, and PDF output is possible via JClass PageLayout. Finally, there is improved support for internationalisation. JClass 4.0 products are available separately or in a Standard or Enterprise suite with pricing starting at $1,499 (including one year of support and upgrades).

w www.klgroup.com/jclass/

Java in 3 Editions

Sun is redefining the architecture for the Java platform with the aim of making it simpler for developers (and service providers) to target specific markets. There are to be three forms: Standard Edition (J2SE), Enterprise Edition (J2EE), and Micro Edition (J2ME). Each edition combines Sun JVMs, the Java programming language, core packages, and optional packages.

J2EE is designed to have the functionality required for heavy-duty server-based systems, and J2SE provides functionality for desktop or workstation devices. The optimised Micro Edition is a runtime environment small enough to fit reduced memory consumer devices and can help share functionality between resource-constrained clients and a server. A key component of J2ME is the K virtual machine (KVM, formerly known as project KJava VM), designed for high-volume, small-footprint consumer lifestyle products.

Sun will provide sets of APIs, called profiles, with the specific Editions, to create a complete deployment environment for devices in a specific vertical market, ie a wireless profile for low-end cellular phones and pagers. To help ensure cross-platform compatibility, each edition has a set of compatibility tests to verify that all applications written for a particular platform can run seamlessly across all compatible implementations of the platform. Similarly, each profile will have a compatibility test suite.

w www.sun.com/java

Bluetooth

With the first Bluetooth products expected by Xmas, it was high time for a test platform to be available for software developers. Digianswer has such an offering with its Bluetooth Development Tools. These include a Type II PC Card and an RS232 adapter. Both come with a full Bluetooth stack. The software can be upgraded, freely, up to v1.0 of the Bluetooth spec. Apps can address the stack through the VComm API, the NDIS 3.1 API, or through a proprietary higher-level Digianswer Bluetooth API. The tools are priced at $4,995 with a discount for multiple units. You'll probably need at least two to communicate. Counterpoint Systems Foundry is also working on a Bluetooth stack based on its IrDA one, but it should be available only towards the end of the year.

w www.digianswer.com

Rational Suite 1.1 features load testing and business process **modelling** enhancements for team development. It can generate automated performance tests directly from application models. **Rational Rose 98i** also sees new functionality for business process modelling (support for UML 1.3), data access (using VB to map objects to database tables), and team development (integration with ClearCase).

www.rational.com

JRun 2.3.2 supports the JavaServer Pages (**JSP**) 1.0 specification, which was released 1 June 1999. JRun provides an environment to build and deliver Java servlets and JSP-based web applications on a range of platforms. In June, **Allaire** acquired LiveSoftware, the creators of JRun, as part of a strategy to add support for server-side Java across Allaire's products. For Windows, Unix, Linux, MacOS, and NetWare, JRun is available in three forms, including a free five concurrent user edition.

www.jrun.com

Aimed at the problems within an **EJB** environment of mapping a complex object model to a relational database, TOPLink aims to separate the details of persistence from business logic. **TOPLink for BEA WebLogic** integrates with the WebLogic application server, which is written completely in Java. Like TOPLink for Java, it features a visual editing tool for building descriptors and mappings, object-level transactions, and querying in terms of objects not rows.

www.objectpeople.com

Books received this month

Publisher	Title	Author	ISBN	RRP
Wrox Press	Designing distributed applications	Stephen Mohr	1-861002-27-0	£45.99
O'Reilly	Developing ASP components	Shelley Powers	1-56592-446-0	£19.95
Wrox Press	Enterprise application architecture	Joseph Moniz	1-861002-59-0	£43.99
O'Reilly	Enterprise JavaBeans	Richard Monson-Haefel	1-56592-605-6	£21.95
O'Reilly	Java 2D graphics	Jonathan Knudsen	1-56592-484-3	£19.95
O'Reilly	Learning DCOM	Thuan L. Thai	1-56592-581-5	£21.95
O'Reilly	Programming with Qt	Matthias K. Dalheimer	1-56592-588-2	£21.95
O'Reilly	Webmaster in a nutshell	S.Spainhour & R.Eckstein	1-56592-325-1	£15.95

Swinging the lead

Contractors have had an easy life for too long. Now it's getting a bit tough, they're complaining. Jules investigates.

Contractors have an image problem. Compared to permanent employees, they get paid twice as much, they don't seem to pay any tax, and they get six months holiday per year. Real employees with whom they have to work, and even the managers who recruit them, think contractors have it made!

The reality is not quite like that. Unless you're a contractor, you wouldn't have noticed, but there's not a lot of contracting work about at the moment. Traditionally, the banks were the biggest employers of contractors, but the banks at the moment are so worried about the Millennium Bug that they seem to be cancelling all other development, saving their 'limited' funds in preparation of paying extraordinary fees to permanent employees for working the New Year's Eve shift. Since June, contractors have been asked to sign contracts for work starting in January or February, and when they ask, 'So how am I supposed to live until then?' they are scornfully told, 'You should have put some of your overpayment away in savings!' Engineering has never paid (or even recruited) the way the banks do, but there's even less work around now. As for the agencies, being middlemen in a traditionally employer-led market, many agents have treated their contractors with disdain (contractors being, after all, the 'product'), but now there are fewer jobs they are discovering what it is to be a seller in a buyer's market – serves 'em right!

Contractors aren't the enemy. First, look at it from the employer's point of view. He gets a ready supply of skilled workers, in whatever disciplines he wants, whenever he wants them. The rates might seem high, but you should recall that the employer is paying no National Insurance, providing no perks, and doesn't have any difficulties with job security, because all transactions are business-to-business. Even at this, first sight, contractors are often cheaper than permanent workers. But, there's another, even more important issue. In an industry where current and breaking skills are so valuable, the only way to get those skills is either to hire them or to train your own people. But training your own people is something that the British employer is very reluctant to do – you shell out good money so your worker can demand a pay rise, then he leaves for greener pastures taking his new skills with him. The only real source for current skills is the contract market.

Look at the same issues from the contractor's side. Obviously, he must work to live, but in addition he must provide transport, health insurance, and sick pay for himself, and he must schedule unpaid time out of his working life to acquire those current skills and to look for more work. He's also got to try to guess which of the presently emerging skills are going to be the useful ones. A contractor who can manage to work for more than six months of the year (and sustain it) is doing very well indeed.

As if that's not bad enough, contractors are being hit by a double whammy. It's not only employers, colleagues, and the agents who don't like contractors, it's the taxman. Noticing that contractors run their own businesses (because, in most cases, the employers' lawyers demand they do), and pay themselves dividends as if they were proper businessmen, the taxman is effectively trying to remove the company status, and to tax dividends and training as if they are salary and benefits. It's already happened in Germany.

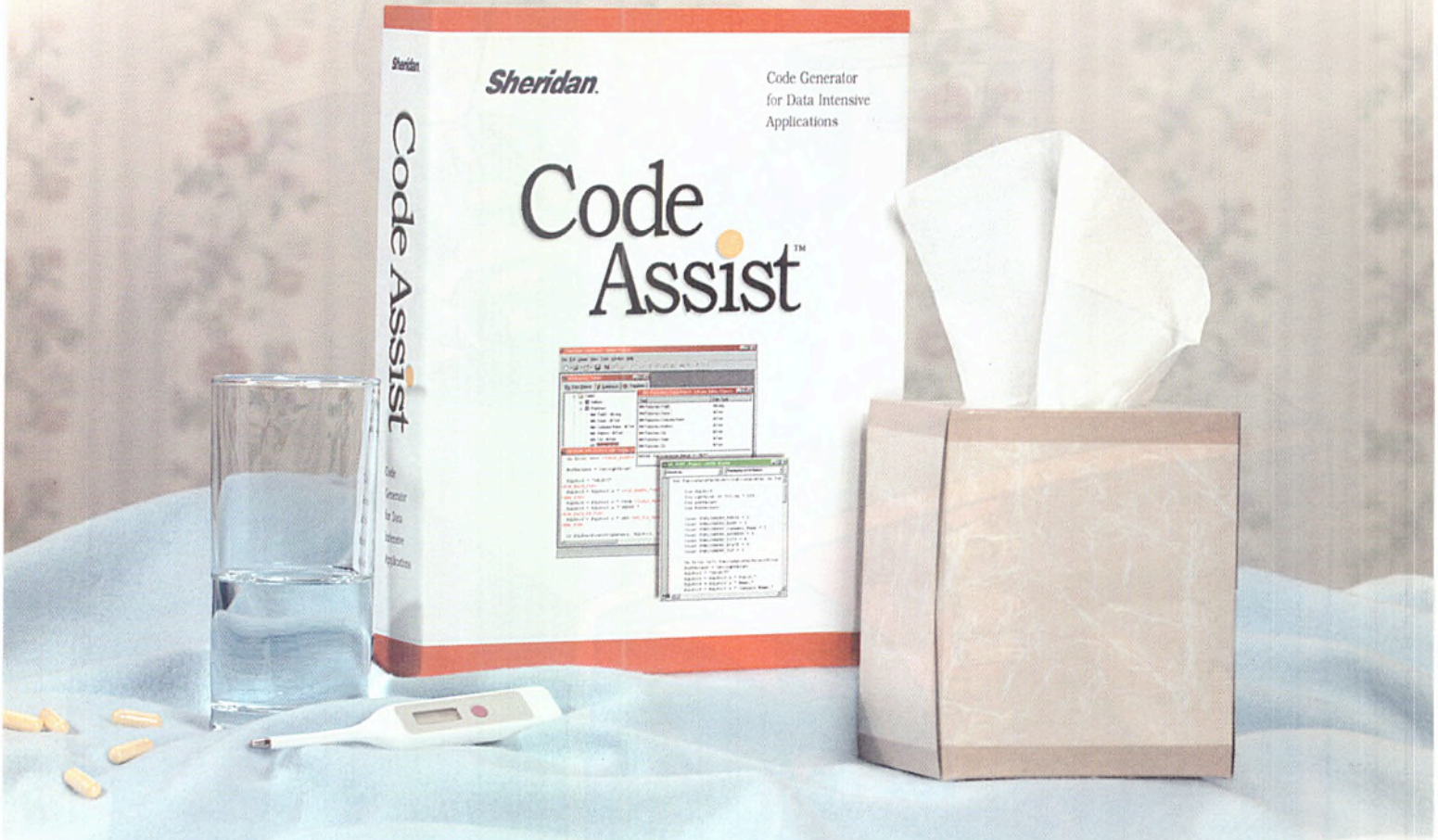
This is discrimination. A contractor has lots of expenses that a permanent employee doesn't have, including an accountant and VAT. He has to provide for his own training, and while paying for it, he's not earning. He has to provide his own health insurance, his own sick pay, and his own transport to the various different sites. By claiming that the contractor is, in reality, just an employee by another name, he is being denied the ability to invest in his business that any other businessman takes for granted. Imagine, for example, what would happen if a builder had to buy materials or pay labourers out of his taxed income! Even a writer gets to spread earnings over time and to deduct research costs.

The jobs drought, and the tax bullying, coming as they do together, will make contracting distinctly less attractive and, like everything else that we take for granted, we will realise how important contractors are when they've gone. The fact is that the computer business needs a fluid workforce, and it needs constant retraining of staff, and without those things we wouldn't have a computer business at all (or at least, not one that can compete on a world stage). The contracting system handles these requirements admirably. These tax rules attempt to dismantle the system, and unless we pass legislation to force employers to train their staff, and to erode permanent workers' job security still further, the requirements won't be answered at all. Now we've destroyed our manufacturing base in favour of 'white industry', we'll hobble our white industry too, and be left with nothing except the civil service.

Of course, contractors won't go away entirely. The nature of the job demands people who are flexible, and most contractors are programmers who are good at finding bugs and consequently will track down every loophole that the rules will create – this is one game that the taxman can't win! But the idea that contractors have been swinging the lead for too long, and that they are no more than salaried employees, strikes me as pernicious and dangerous, and encoding such prejudice into legislation will antagonise the situation even further. ■

Jules is a long-time contractor, working in programming and other fields. When he grows up, he wants to be a tax exile – but not before. You can contact him on 01707 662698, or at mayhem@jules.cix.co.uk.

A Cure for the Common Code.



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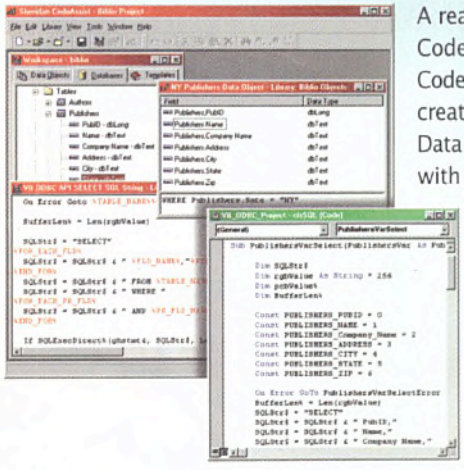

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Practical user groups

Dear Sir,
With regard to David Johnson's letter in July's EXE (*Joining user groups*), he should try going to such a user group meeting before he gives an opinion about them. He seems to be under the impression that user group meetings are where people who are interested in the details of the language meet to discuss the need for `ifend`. He thinks they would not be of interest to developers only interested in creating a system and getting paid for it.

I joined the Borland User Group a year ago, and have been to two meetings and had about six newsletters. Pretty much everything about BUG is information on how to achieve things in real-world applications. The meetings have been examples of how to implement new (and old) technologies, how things work, and how to get components to do advanced things that are required in real applications.

David Johnson says that there will be people who disagree with his view, but I disagree not because I support those who 'operate at the coal face of the language' but because he is plain wrong in his premise.

I encourage him to attend a meeting and find out how practical it is for himself. As a professional developer myself, it has already paid for the time spent.
Matthew Jones
mattjones@cix.compulink.co.uk

Putting Windows in their place

Dear Sir,
I read the article *Putting Windows in their place* (EXE, July 1999) with a rising desire to shout 'Aaaagh!' at the Microsoft developers. Most of the installation conflicts in Windows are due to two practices:

1) 'All DLLs go in */WINDOWS/SYSTEM*'. This gives the usual wrong-version/missing faults.
2) The pernicious practice of Microsoft applications of 'upgrading' the operating system when installing applications. This is a bad habit caused by the source code to the operating system being available to the app writers, allowing them to 'patch' system services that don't do quite what is wanted.

By only installing files into the application's directory, the operating system won't get corrupted.

The other problem is that the program's Registry settings are only stored in the Registry. When an app must be re-installed (after reinstalling Windows *again*) all the user settings are lost. If applications kept a local `reg` file, which gets re-applied when the app is first run after Windows is re-installed, the overall configuration of a machine would be much easier to re-create.
Hayden Clark
mail@clarkgroup.co.uk

Registration

Dear Sir,
I find the policy of registering to access a website objectionable. This is not how the Web was intended to be. I object to giving any personal details on *any* occasion that I do not deem it appropriate. While my seven days of 'free access' was welcome, that was as long as I considered accessing your site. Shame, because there are a lot of good things on the site, particularly the archive of columns.
Name and address withheld.

The good news is that Exe OnLine is now completely open – you do not have to register to gain access to the wealth of content (the archives are building nicely). This has the added advantage of allowing easy linking to EXE OnLine. A nice example is the Spirit of Delphi link from the Borland site. See *www.borland.com/delphi/* – Ed.

The Tardis of love

Dear Sir,
In your June '99 number, Jules May writes: 'Gone are the days when you could pull every bird at a party by saying, "I'm a computer programmer" (or even, "I'm a knowledge engineer").'

I have recently been fortunate enough to acquire a small Type 39 Tardis as part of a legacy from a maiden aunt. If Mr May could see his way to providing the precise Space/Time coordinates of the happy era that he describes, I would be most grateful, as I should like to travel to it and see it for myself. And if any of your other readers would like to accompany me on the trip, I would be happy to consider their requests, especially if their requests were backed up with suitable quantities of folding currency. After all, I'm not a charity you know.

Insincerely
Will Watts
Chiswick

IR35

Dear Sir,
I would like to take this opportunity to publicise both to yourselves and your readership the existence of a pressure group formed to represent the interest of independent contractors (*www.ir35update.co.uk/join*).
Andrew James Johnson
andy@sharry.demon.co.uk

Jules May has also referred us to *www.engineerjob.com/update.html* – Ed.

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@exe.co.uk*

JaCC Autumn '99

The *Java and C/C++* developers' conference (Oxford Union, September 15-18), co-organised by EXE and the ACCU, features a raft of top quality speakers, including Dan Saks, Andy Koenig, Barbara Moo, Jim Coplien, and Leen Ammeraal.

Remember that to qualify for the early-bird discount you need to book by August 14. Prices for the early birds are: £75 per day for EXE subscribers & ACCU members (£95 otherwise). You can book the full four days for the price of three, and the discount still applies.

Call Jenny Lowe on 0171 970 4772 (fax 0171 970 4797) or email *jacc@exe.co.uk*. For more details see: *http://www.exe.co.uk/jacc/*

JBuilder 3 – Java under analysis

Borland's JBuilder 3 sees support for a range of the latest Java features from JDK 1.2 to EJBs. Alan Griffiths puts it to the test.

During the early '90s I upgraded my home computer on a regular basis (around 18 to 24 months) in order to keep pace with the increasing demands placed on it by the development tools I was using. Something strange happened in the latter half of the decade – I started using Java (instead of C++) for my recreational programming and the demands actually declined! For a variety of reasons, development using Java technology is a lot less resource-intensive than using C++.

A change in my approach to development tools has also helped with this reduction in demand – rather than using an IDE to supply all my needs I've been supplementing the JDK with purpose-built tools like a 'programmer's editor' (CodeWright) and the 'jikes' Java compiler from IBM's 'alphaworks' website (*http://www.alphaworks.ibm.com*). And this approach works for C++, too. I recently removed MSVC++ 4 and replaced it with the Cygwin development tools and gained over 150 MB of disk space in the process. As a consequence, my current home computer has survived without a hardware upgrade for over three years!

Sadly, this system (P125/32 MB) is now totally inadequate to support JBuilder Enterprise. JBuilder is big – not so much in terms of the disk space it requires (only 215 MB for a full installation) but in terms of the amount of RAM required to start it up. According to the `README`, the minimum requirement is 128 MB of RAM (and a P166). I tried it on such a machine, but while it does run in this amount of memory, when working through the 'hello world' tutorial and switching between the IDE and the help system there were poor response times and noticeable disk activity. (I took a peek at the system memory and this was fluctuating between 150 and 170 MB.) On this basis (and since I usually have a few other applications running) I'd want to equip a development machine with around 192 MB for serious use.

Having said all that, I borrowed a P133 with 96 MB of RAM for the review period and, so long as I stayed within the IDE and avoided the help system, it was perfectly responsive. According to the Borland website (*http://www.borland.com/jbuilder*), the Professional and Standard variants require less RAM. This may be true – I've not seen them. However, I was working through a very simple example and wasn't using any Enterprise-specific features.

In the past, I've used Visual Café, Java Workshop, and VisualAge for Java. These are all popular products and the only one of these that came close to JBuilder's memory requirements is VisualAge. Compared to the £1,500 price of JBuilder Enterprise RAM is cheap, but many other things can make it an issue – corporate bureaucracy is one. I spent a good deal of time, a couple of years ago, making the case that the 'standard configuration' for developers had an inadequate amount of RAM. That fight is now won for me, but in other organisations it may not yet have been addressed.

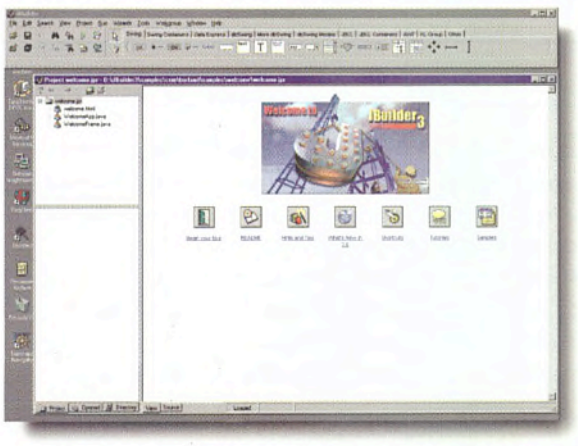


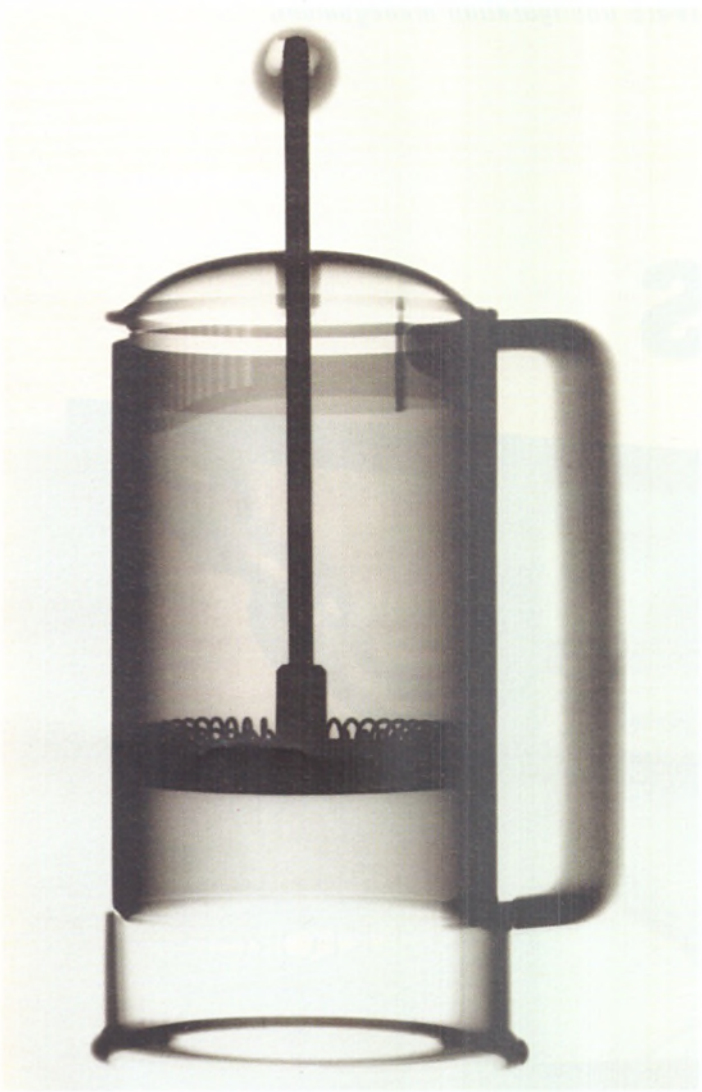
Figure 1 – The JBuilder welcome screen.

Java 2

The development of the Java platform is tightly coupled with the Java Development Kit implementations that Sun develops. The reason for this is simple – Sun both controls the Java standard and provides a free, *de-facto* reference implementation of it. Currently, Sun's JDK is at version 1.2.1 (the first 'bug fix' release of 1.2) and 'Java 2' is the version of the Java platform implemented in JDK 1.2.x. According to an advertisement I have in front of me, 'JBuilder delivers Java 2.0 support first'. (I think this claim to being first is a trifle exaggerated, but no doubt Borland would argue that the existing suppliers of Java 2 support are not competing in the same race.)

Sometimes I feel a little like King Canute – there are serious problems in the GUI event handling in JDK 1.2, JDK 1.2.1, and in the first candidate release of JDK 1.2.2 (CR1). These have discouraged me from using Java 2 for GUI code (I do use it for servlets). Meanwhile the Java 2 wave washes past me while I say, for instance, 'Stop! <Alt>-key mnemonics don't work as advertised.' While I know there are workarounds for many of these problems, I wish that instead of producing an ever expanding range of APIs, Sun would concentrate on getting its implementation working. (While preparing this review I received email notification from Sun's 'bug parade' database that this problem has been fixed – I'm looking forward to JDK 1.2.2!)

Anyway, as a result of this issue, there are a number of characteristic problems in GUI-based Java applications running under JDK



1.2 on Windows. The JBuilder IDE is clearly a Java 2 application running the Swing 'Windows look and feel' since it suffers from a number of these problems. For instance, the first dialog in creating a new project allows you to tab into a 'comments' field – subsequently, to get out of that field or to select an action button, it is necessary to use the mouse.

Borland has attempted to deal with some of these problems. For example, to avoid the problem with <Alt>-key mnemonics mentioned above there are no keyboard mnemonics for action buttons on any of the dialogs. I find this a source of constant irritation since I need to tab to the appropriate action button (or, in some cases, reach across the desk to use the mouse).

Obviously, there are marketing advantages to shipping under the Java 2 logo and Borland is committed to removing the last few traces of Delphi code from JBuilder and launching a 'pure Java' version on Solaris and Linux later this year (and there should be a 'pure Java' update to the Windows version). On the other hand, being a Java application is no excuse for a sloppy user interface; JBuilder is competing on Windows and should conform to the spirit, if not the letter, of the *The Windows Interface Guidelines for Software Design* (ISBN 1-55615-679-0). Instead of this attempt to ride the Java 2 wave, I'd prefer a keyboard-friendly IDE with action button mnemonics (even if it was based on JDK 1.1) that allowed me to select Java 2 as the development platform.

Support for JDKs

Sun has shipped JDK 1.2 on its version of Unix and for Windows, but it is still actively supporting JDK 1.1 – both 1.1.7b and 1.1.8 shipped after Java 2 was launched. On most other platforms, JDK 1.2 is yet to ship. For example, IBM provides JDK 1.1.7b on most – if not all – of its platforms (and for Windows) and JDK 1.1.6 for Linux. Apple supplies JDK 1.1.7 for the Mac, and Symbian supplies JDK 1.1.4 for Epoc (for Psions and mobile phones). It is a heterogeneous Java world and developers will need to support a range of Java versions.

JBuilder comes with JDK 1.2 but it is designed to support development for a range of different JDK versions. I currently make more use of JDK 1.1 than the JDK 1.2 that ships with JBuilder. This means that one of the first things I did was to switch to IBM's Windows JDK 1.1.7b with Swing-1.1.1-beta1 (I happened to have these installed on the PC I used for JBuilder). This was wonderfully uneventful: it was obvious how to do this. It worked first time and I didn't encounter any problems.

For any version of Java and/or associated packages you can define a 'JDK' within JBuilder – supply a JDK, specify the search paths, and it is done. Having defined a JDK, JBuilder remembers the paths associated with it. It also allows you to specify the default JDK for new projects, set different JDKs for different projects, or to change the JDK being used for a particular project.

Borland missed an opportunity here – the name is taken from the JDK and duplicate names are not allowed (I'd like to set up one JDK to be 'IBM's JDK 1.1.7b with Swing-1.1' and another to be 'IBM's JDK 1.1.7b with Swing-1.1.1-beta1'). Admittedly, it is possible to select the libraries for each project, but the ability to define standard configurations and switch between them would be nice.

The need to support a range of development and deployment environments isn't likely to change in the near future. JBuilder's support for this is a lot more maintainable than the batch files I've currently got set up to manage a range of Java environments.

What's in JBuilder?

The exact complement of features varies according to the edition of JBuilder (Standard, Professional, or Enterprise). As I've only seen the top-of-range variant I don't have detailed knowledge of the others – I trust that they are similar, with some features unavailable. Where Borland's documentation or advertising identifies which variants contain a feature I'll mention it, otherwise *caveat emptor* (see a feature matrix at *http://www.borland.com/jbuilder/productinfo/feamatrix/*).

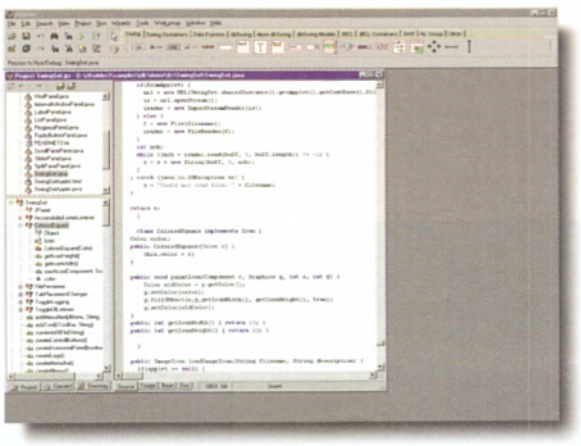


Figure 2 – The source editor (open on the SwingSet demo project).

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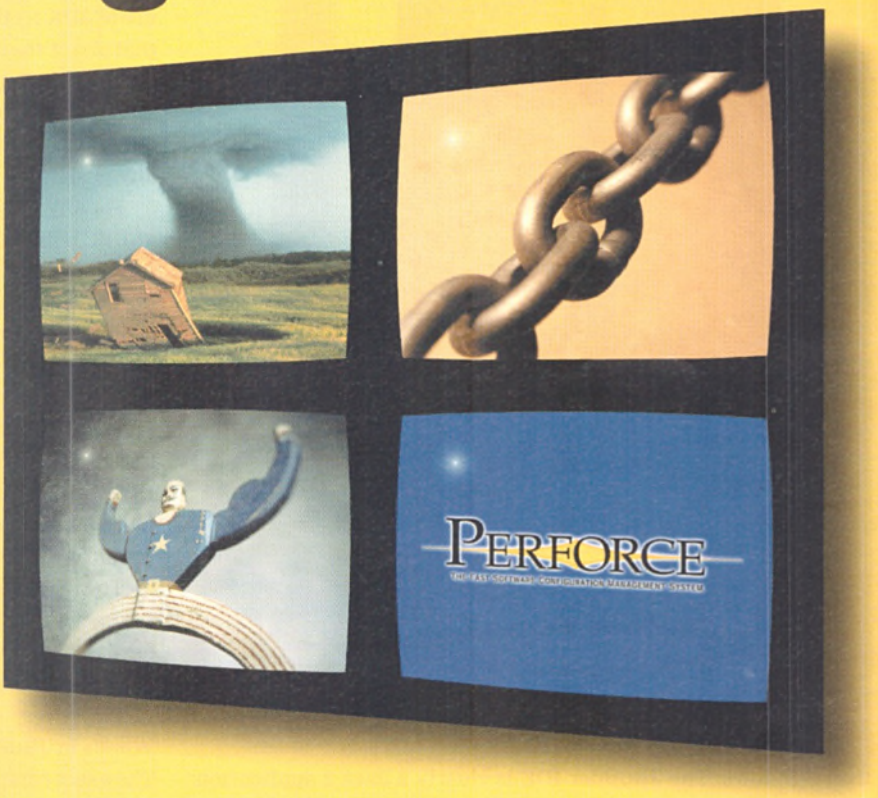

- It routinely manages code bases of more than 100,000 files, including source, document, and Web content.
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As one would expect from an IDE, there is an integrated source browser/editor, a GUI design tool, a Bean design tool, a debugger, and a conjuration of wizards. I'll cover each of these in more detail below. But first a quick tour of features that are worth a mention, but that I don't have space to cover in detail.

ObjectSpace's excellent JGL container and algorithm library is included. Although this is freely available from the Internet (*http://www.objectspace.com*), its inclusion is useful as it contains powerful tools that reduce the need to reinvent wheels. Sadly, Sun appears to have suffered an attack of 'not invented here' and produced its own containers package in Java 2 instead of adopting the JGL library into the standard. I fear that JGL, despite its merits, will be swept aside by the marketing force of 'free *and* from Sun'.

Borland has developed a collection of complementary packages that extend the support for database access and display beyond that provided by the standard JDBC and Swing libraries. The level of support varies between the Enterprise, Professional, and Standard variants: at the higher levels, it contains classes such as 'data aware' extensions to Swing and data access components that provide the support these require.

In the Professional and Enterprise editions are the InfoBase database server and a 'companion tools' CD of third-party software. This is a compendium of 'lite' versions, trial versions, and freely licensed software – do read the licence conditions of any you choose to use. (If your 'companion tools' CD has a root directory overwritten with the installation directories of all of these products and consequently doesn't work, don't worry; Borland has identified the problem and is shipping replacement CDs on receipt of registration details.)

The PVCS version control is integrated into JBuilder Enterprise. PVCS is a workmanlike product that has an established reputation – it does the job. If you are looking for 'everything in one box', then this will probably meet your version control needs. For me (and many others) its inclusion is an irrelevance: the whole point of version control software is that it is boringly reliable and stable over time. I already use Visual SourceSafe at work and RCS at home and am not going to switch.

In JBuilder Enterprise, there is a Pure Java database engine, DataStore. This may be embedded directly into an application, either to remove dependencies on an external database engine or to cache result sets. This all goes beyond the data access requirements of the type of application I deal with in Java, so I'm not qualified to comment on the usefulness of these components in a production environment.

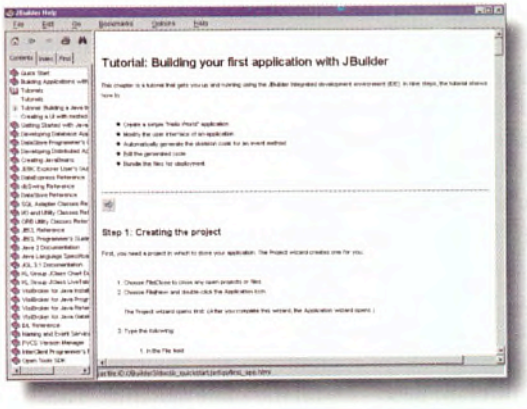


Figure 3 – The help system.

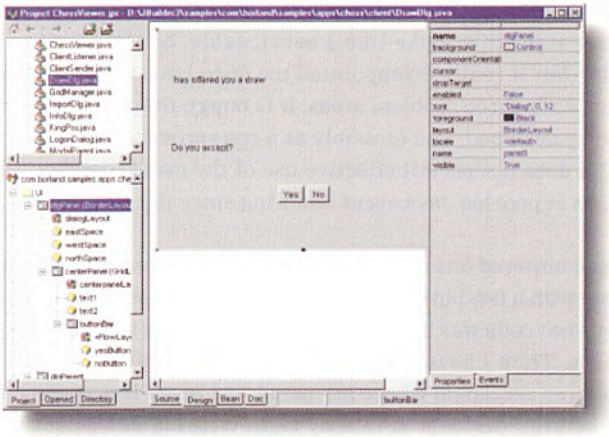


Figure 4 – The GUI design tool.

Something I intend to experiment with is the VisiBroker Object Request Broker for Java 3.3 (only in the Enterprise edition). The Enterprise box also contained C++ Builder version 3 (version 4 is current), but this isn't mentioned in any JBuilder documentation that I have found.

Source browsing

When I'm developing software, the three tools I use most are a wordprocessor, an OOAD package, and a source editor. Of these, the IDE only contains the source browser/editor. Consequently this is the part of the user interface I expect to interact with most and therefore the most important. (Well, it would be, except that having a decent editor is so important to me that I have abandoned the rather weak offerings provided in various IDEs.)

The editor in JBuilder provides the basic functionality, although I don't like any of the supplied key-bindings and there doesn't seem to be a way to set up alternatives. For example, most of the products I use will indent (unindent) blocks of lines using tab (shift-tab) – a common activity, with a single action. In JBuilder, this is an awkward double action: Ctrl+K-I (Ctrl+K-U). The auto-indent feature is also fairly primitive, taking no account of the language (one has to unindent before entering a closing brace). And I find the multiple-file text search facilities somewhat limited (eg you are shown the files containing matching lines, not the lines themselves).

This wouldn't bother me if it were simply a matter of switching away from JBuilder to an external editor. However, Borland has had a long-standing policy in IDEs of compiling directly from the edit buffer and only touching the disk on an explicit save. (Clearly many people have far more faith in the stability of Windows as a development environment than I have.) The result of this philosophy is that JBuilder doesn't have the option of automatically saving files when it loses focus – something that I find avoids accidents. At least it does automatically reload files that have been modified externally.

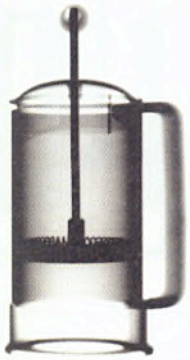
On the plus side there are useful browser-panes for selecting the source file within the project (or among the open files, or within the directory) and the class member within the current file. However, these browsing facilities fall short of the class browser functionality I've seen in some tools. Having selected the current file, it is possible to switch from the text editor to the GUI design tool, the bean design tool, or the documentation tool. These replace the text editor pane.

GUI design tool

At first sight this looks like a serviceable, but unexciting GUI builder, but it really disappointed me once I started trying to use it. There are three problem areas: it is buggy, the code it generates is poorly designed, and (possibly as a consequence of the previous item) it does not permit effective use of the event 'listener' idiom that has supported Java event handling since the early day of JDK 1.1.

I encountered one of the most obvious problems when I created a panel with a few buttons on it, switched to the source pane (partly to see what code was being generated), and made a few code layout changes. Then I switched back to the design pane, only to see a blank grey rectangle where my panel had been! It was some time later before I discovered that by right-clicking and selecting the current 'look and feel' that the panel could be restored to visibility. Generally, I found it very intolerant of code changes: less so than the first versions of Visual Café and VisualAge for Java that I used a couple of years ago – and JBuilder is at version 3.

I guess I should know better than to look at automatically-generated code; it always gives me an uneasy feeling. The code generated by JBuilder's GUI design tool is no exception. In the original JDK 1.0 it was necessary to subclass dialogs and other windows in order to handle events, but this was fixed long ago in JDK 1.1. In addition, the content and layout of a dialog should be controlled by its state, not by its taxonomy. For example, one can (and, in most circumstances, should) create a `JDialog` and specify its contents, layout, and the actions it can invoke without creating an additional class. This increased flexibility is not reflected in the generated code; although it uses the syntax of the revised event model, it has stuck with the old design. For example, a class `MyDialog` will be derived from `JDialog`, and anonymous local classes (or optionally, named classes) will be used to forward UI events to member functions of that `MyDialog`.



I was expecting to be able to use the GUI design tool to attach UI events to methods on any accessible objects – the motivation behind the change to the Java event model was to support this (because the original approach becomes unbearably clunky). In fact, this facility is so desirable that IBM even engineered it on top of the 1.0 event model in the first release of VisualAge. If IBM was supporting this two years ago in the face of resistance from both the language as then defined and the old event model, then surely Borland ought to have caught up by now! Introducing the unnecessary `MyDialog` class, and routing

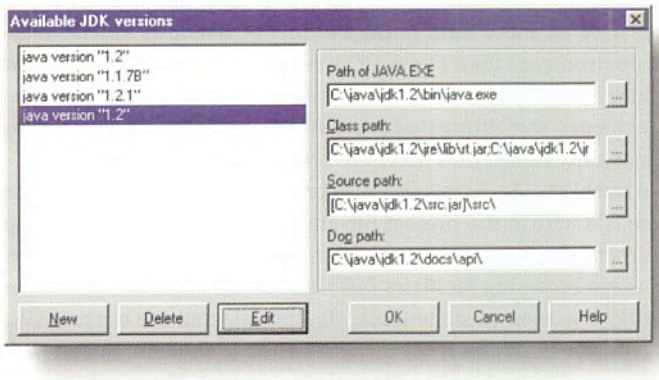


Figure 5 – Defining JDKs.

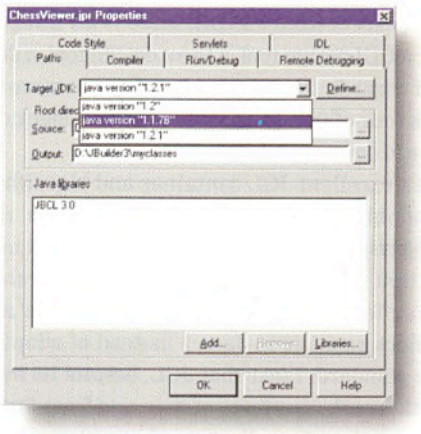


Figure 6 – Selecting a JDK for a project.

all messages to it, seriously impacts the coupling of the resultant code as `MyDialog` needs to 'know' about all the messages and all the sinks (although the code you write within it may forward again to a sink, redirector, or broadcast object).

Many GUI design tools lack proper support for internationalisation and localisation and JBuilder is no exception. The standard Java library provides support for 'resource bundles' that are managed according to the current 'locale'. Text strings used in the user interface should be held in resource bundles. JBuilder takes the less flexible approach of hard coding the strings into the generated code. Admittedly, there is a separate Resource Strings Wizard available to update classes to use resources in place of hard coded strings, but it seems a shame that this approach isn't integrated into the design tool. (To ensure consistency, the Resource Strings Wizard usually needs to be re-run after any reworking of the design.)

JavaBeans

One of the many technologies in the Java family is that of 'JavaBeans'. This standardises the way in which Java components are built and combined. At one level, it is a set of criteria that a class must meet before it is considered a JavaBean (it is usually *a* class – it is possible to use two classes to make a JavaBean). At another level, it is a way of ensuring that components from different suppliers can be used in the same system and can be manipulated by any component assembly tool.

The JBuilder browser includes a class design tool that automates achieving conformance to the JavaBean specification by generating the 'boilerplate code' required by the standard. This is fine, but when it comes to support for using JavaBeans things are not so wonderful. Some JavaBeans are graphical components and can be handled to some extent in the GUI design tool, although the limitation imposed by directing all event notifications to the container is a pain. Other JavaBeans are non-graphical and the support for assembling these is even more limited.

In JBuilder Enterprise, there is a wizard that creates Enterprise JavaBeans (EJBs). These conform both to the JavaBeans specification and to a number of additional criteria (such as supporting the creation of proxies) that allow them to be deployed in a distributed environment. Don't assume that this is only for vast applications running on networks of computers – the 'distribution' may only be between different processes on the same machine. This use of Java goes beyond my area of expertise, so I can't comment on the effec-

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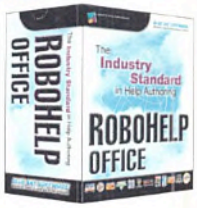

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tiveness of this tool beyond the fact that I could quickly create a test program that ran successfully without taking time to learn the detail of the EJB specification. (Clearly wizards are no substitute for knowledge, and in a production environment I'd want at least one team member to understand what is going on – but it is definitely easier to start from a working model.)

Debugger

It is hard to get excited about debuggers in general (in truth, I don't use them much), and it is hard to get excited about this particular one. The basic functions (breakpoints, thread status, and so forth) are all supported. One disappointment to me is that a favourite technique of mine – directly invoking a debug method, `dumpStatus` or `checkInvariants`, from the debugger – isn't supported. Basic expressions can be evaluated, but expressions that invoke method calls lead to the slightly mysterious error: 'Not supported: remote method call'.

The debugger worked quite happily with both the supplied JDK and with the IBM 1.1.7b JDK that I added. However, it does not support JDK versions that are prior to 1.1.5.

Since it is possible to have several projects open simultaneously, it is possible to start multiple debug sessions. Naturally, each project may be using a different JDK, so with a bit of fiddling about one can debug the same code side-by-side under different JDKs to check for differences.

Another use for multiple debug sessions is to debug both the client and server of a locally 'distributed' application. In the Enterprise edition there is a facility for 'remote debugging' on any target platform that has a reasonably recent JDK version (I didn't have the opportunity to try this).

To facilitate the development and testing of servlets in JBuilder Enterprise, Borland has incorporated Sun's free Java Web Server (this is available at *http://java.sun.com/products/*). Using a Java-based web server allows servlets to be debugged by running the server under the debugger. (By forcing this web server to use a non-standard port address, I persuaded it to run alongside my normal Apache web server as a test environment.)

A conjuration of wizards

For many routine tasks there are wizards. One that I really liked was the Packaging Wizard. This takes a project, examines the dependencies on library classes, and constructs a tree showing the packages required for the project to run. The nodes in this tree can then be checked for inclusion in the `jar` archive in which the project ships. (No excuse now for forgetting that utility library used once in some dusty corner of the program.) This wizard is found in all three variants.

I was rather hoping that the Javadoc Wizard would be a tool to aid in the generation of 'doc comments' that are consistent with the code. But it isn't. It is simply a shell around `javadoc`, giving a GUI version of the command line switches.

JBuilder Enterprise has an 'application generator' that automates the separation of a server application engine and a client user interface. This supports three options for communication: via Corba, via Java RMI (Remote Method Invocation), and by HTML. The last option may use JavaScript and requires Netscape 4 or Internet Explorer 4 on the client.

There is a variety of wizards for generating the skeleton code for applets, servlets, applications, frames, panels, etc. These generate a couple of basic classes (and possibly a web page for an applet to be displayed in) and load them into the edit/design tool. The number of wizards available increases from JBuilder Standard through Professional to Enterprise, but many of them are not mentioned in the literature.

The bottom line

There are quite a lot of things about JBuilder 3 that I like. And there are quite a few that I dislike. Many of the things I dislike also apply to the competition. For example, I've never used an IDE in which I've liked the editor. (Programmers seem to divide into two camps, those that use whatever is in the IDE, and those that use a more powerful external editor such as Emacs, CodeWright, or SlickEdit. You will know your own preferences.)

Furthermore, I tend not to develop much code for the areas covered by the code generation wizards – and when I do I want it to fit with the architecture of the application rather than the other way around. Here, the event-handling model adopted by the GUI design tool, and the omission of a tool for 'wiring up' non-visual JavaBeans, limits the usefulness of JBuilder. The systems I work on are mainly processing with a bit of UI and data access on the edges. Many systems are mainly UI and data access with a little processing in the middle. If your work falls into the latter category, then JBuilder will have more to offer in this area.

I guess the bottom line is that JBuilder provides support for a lot of technologies and activities and that if you want to do something basic in one of these areas then the support will be helpful. But while JBuilder is a 'Jack of all trades' it doesn't aspire to being a master in those that matter most to me. ■

Alan Griffiths works for Experian doing object-oriented design and writing C++. He also chairs the Association of C and C++ Users (ACCU) and plays at writing Java. His website is at http://www.octopull.demon.co.uk and his email address is alan@octopull.demon.co.uk. For information about the ACCU see http://www.accu.org or email info@accu.org.

JBuilder 3 Enterprise has an estimated street price (ESP) of £1,699, JBuilder 3 Professional has an ESP of £499, and JBuilder 3 Standard has an ESP of £84.

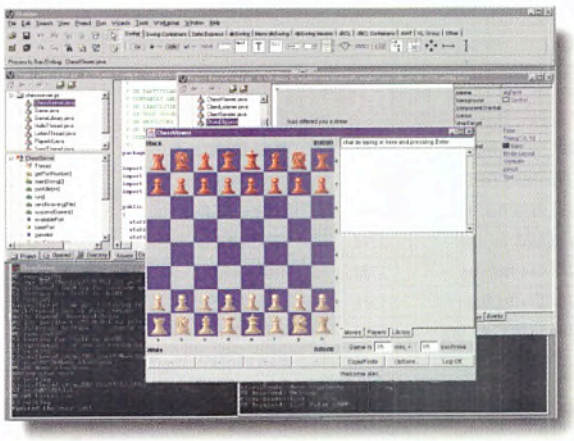

Figure 7 – Running the chess server example under JDK 1.2 and the chess viewer client under JDK 1.1.7b.

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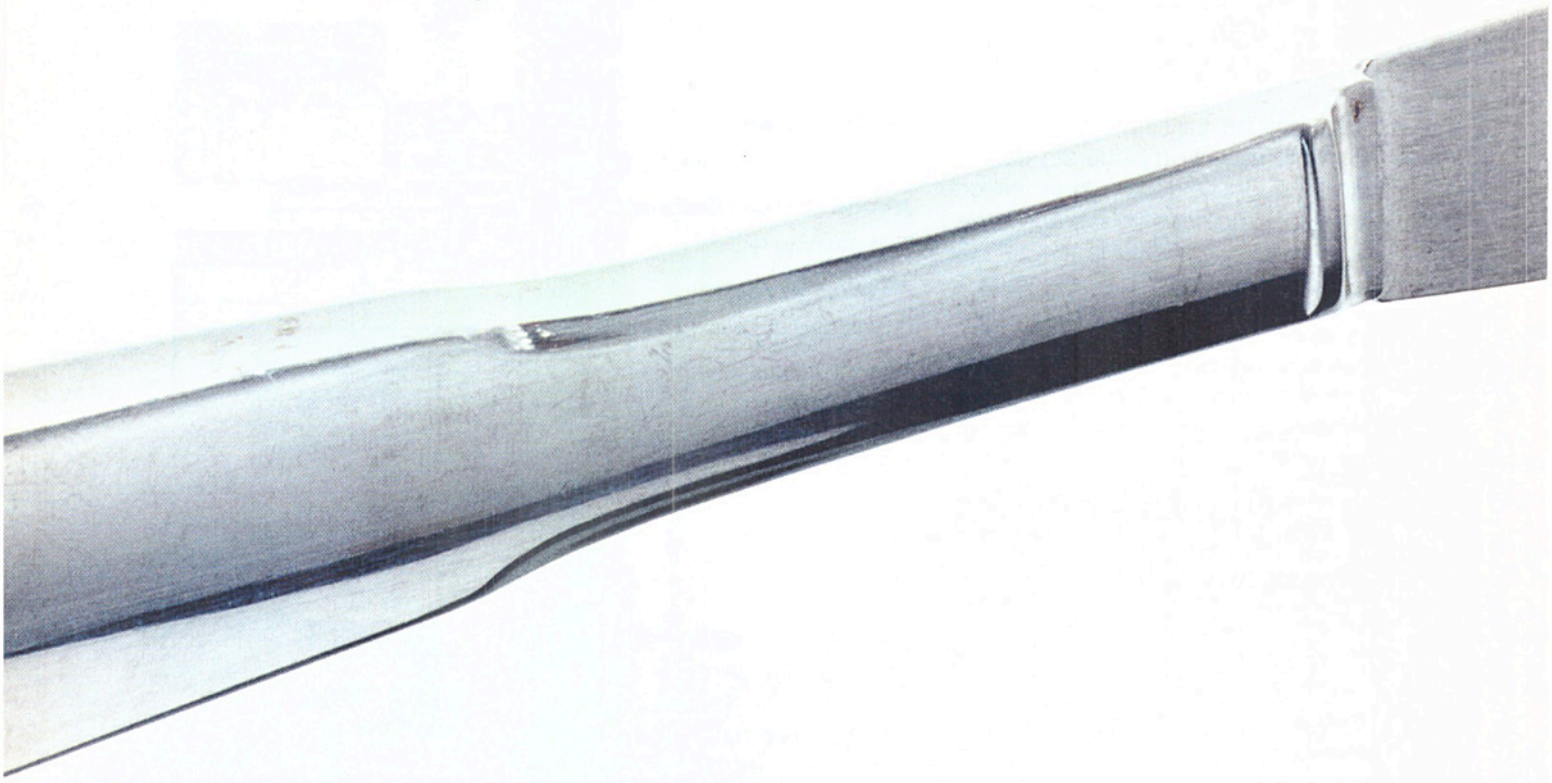

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MuTek BugTrapper v2.0 – reversing expectations

For debugging, just how much information can you extract from non-debug versions of executable files? Dave Jewell believes it is more than you may think.

I probably shouldn't be showing my age by mentioning this, but I can still remember what a thrill it was when I first got my hands on a copy of SYMDEB. This, in case you're wondering, is a somewhat enhanced version of Microsoft's first debugging tool, which – appropriately enough – was simply named DEBUG. Both of these command line tools were routinely used by thousands of DOS programmers to debug their applications which, as often as not, were written in assembler. Funnily enough, DEBUG still exists in the forthcoming Windows 2000 operating system...

Why was I so excited by the arrival of SYMDEB? As the name suggests, it was the first DOS debugging tool that allowed you to view symbolic info during a debugging session. It was possible to feed your executable to SYMDEB along with a special `SYM` file and – hey presto – there were all your function names interspersed throughout your disassembled code. Deep, deep joy...

Well, times have moved on somewhat since those heady days. Debugging tools are a great deal more sophisticated than they were then, and with modern operating systems and applications, they certainly need to be! This article comes to you courtesy of a shiny new copy of Office 2000 running on a beta version of Windows 2000, running on my brand new Dell Pentium III. Everything worked fine until I installed Visual Studio 6 onto this machine, whereupon many weird and wonderful things started happening. I'll spare you the gruesome details and, in fairness to Microsoft, there are some known issues relating to installation of VS6 onto a Windows 2000 system. But most developers would probably agree that Microsoft's quality control is no better than anybody else's, and that's putting things as charitably as possible.

BugTrapper to the rescue...

Be that as it may, there's a possibility that buggy Microsoft software could end up being, if not actually a thing of the past, at least a somewhat lesser problem in the future. The knight in shining armour is BugTrapper, an innovative debugging tool created by an Israeli company called MuTek. I mention Microsoft in this context because Microsoft has apparently licensed BugTrapper for use by their own developers – high praise for MuTek and hopefully, good news for us all...

According to various press releases that appeared in early April, BugTrapper has been licensed to something like 100 internal developer 'seats' primarily in the Outlook, Office, and Internet Explorer groups. By the end of the year, they plan to be using BugTrapper in all development departments.

What exactly is BugTrapper, and why is even Microsoft falling over itself to use it? In the words of David Erb, a manager in Microsoft's Internal Tools Group, 'BugTrapper increases our productivity by allowing us to locate and fix software bugs – especially tricky, hard-to-reproduce bugs – in a substantially reduced timeframe.' At heart, it's a clever utility that logs everything happening inside an executable so that – after a bug has occurred – the developer is able to study the log and determine where (and how) things went wrong. By itself, this doesn't sound especially revolutionary, especially bearing in mind that there are various other utilities that will do a similar job. But what sets BugTrapper apart is its ability to work with the non-debug versions of executable files, and even to provide useful information from a customer site in the field.

Let's start with a simple (though slightly cheeky) example. As you no doubt realise by now, I'm a firm fan of Delphi, and I'm always peeking under the hood to see how things work. Delphi's Object Pascal compiler is contained in a DLL that's separate from the IDE – this DLL is called `DCC32.DLL`. Wouldn't it be interesting to watch how the IDE is communicating with the `DCC32.DLL` as you perform various operations in the IDE? Well, BugTrapper lets us do just that. If you load up the BugTrapper program, you'll be asked for the names of one or more executables to include in the debug session. I simply specified the name of my Delphi 3 IDE, whereupon BugTrapper scanned the EXE file and built a list of all the DLLs that are statically referenced from the executable.

Note: Obviously, BugTrapper will also work with dynamically referenced items (in other words, using `LoadLibrary` and `GetProcAd-`

Ken Laidlaw

dress to specify external DLL routines at runtime), but if you want to do this, you have to manually add the appropriate dynamic link library to the list of statically-linked DLLs.

For every referenced DLL, you can selectively enable or disable the entire DLL, or enable and disable individual calls within that DLL. I told BugTrapper to log all calls to DCC32.DLL, as well as DFWEDIT.DLL (the Borland editor kernel) and DFWKBD.DLL (Borland's keyboard macro processor). Everything else was to be ignored. Having told BugTrapper what I was interested in, I then started execution of Delphi from BugTrapper. The result of all this is shown in Figure 1, where you can see the call log that was produced.

As you can see, BugTrapper lists each call made to the three DLLs of interest, giving the name of the called function in each case – that's quite impressive when you remember that (in this case) no debugging information is available to BugTrapper and that both the Delphi IDE and the various DLLs are all optimised, release executables. You'll also notice from Figure 1 that BugTrapper has figured out that there are three different threads within the Delphi IDE, and has sorted the various DLL calls on a per-thread basis. BugTrapper is fully compatible with multi-threaded applications, and will keep track of any child processes that have been spawned by the initial process.

How is this magic achieved? In the somewhat contrived example that I've given above, all the calls were DLL-based calls. Consequently, it's not difficult to imagine how these calls could be trapped with only minor changes to the in-memory executable image. As you're probably aware, Win32 executables are linked in such a way that all static calls to a DLL are vectored through a jump table of addresses. This jump table is fixed up at load-time by the Windows executable loader before the program actually starts executing. By getting in on the act and patching this table, it wouldn't be difficult to arrange for BugTrapper to get control as appropriate. Dynamic DLL calls (via LoadLibrary and GetProcAddress) are more problematic, but by trapping the actual calls to these two API routines and returning the address of a special stub routine rather than the address of the requested DLL routine, it's again possible to get control at the appropriate time. Old-time MS-DOS 'TSR' developers will understand exactly the sort of trickery that I'm talking about here!

Bring on the .PDBs...

All well and good, but BugTrapper's proprietary call-hooking technology (about which MuTek is understandably saying very little!) really gets clever when it comes time to debug internal calls within the executable. How does BugTrapper manage to do this without extensively massaging the in-memory executable? I'm afraid you've got me there. You'll just have to ask MuTek...

In order to provide this level of detail, you need to give BugTrapper some debugging information to chew on. You'll have noticed from Figure 1 that BugTrapper didn't provide any parameter information for the various DLL calls made, which is understandable given the total lack of debugging information. However, it's worth pointing out that BugTrapper includes built-in support for many of the standard Windows DLLs, and will automatically provide the correct runtime parameter information as part of the execution log, regardless of whether or not you're actually using debug versions of these files.

Be that as it may, BugTrapper is primarily a C++ developer's tool, and is designed to be used with Visual C++ 4.1 or higher. Assuming you're a seasoned Visual C++ developer, you'll know all about PDB (Program Database) files, which are the modern day replacement for the SYM files I mentioned previously. If you're generating a Debug build of your application, then Visual C++ will spit out a PDB file by default. However, it is possible to generate the equivalent debug information as part of the shipped executable for Release builds of an application, and the slim, 104-page BugTrapper User's Guide explains how to do this – it's primarily a matter of setting a few options on the C/C++ and Link tabs of the Project Settings dialog.

Armed with the necessary debug information (or an executable containing this information), you can now feast your eyes upon Figure 2. This is a rather dazzling demonstration of the level of detail that BugTrapper can display when debug information is available. On the left-hand side, you can see the top-level filter tree pane. This pane is also available with no debug information (as in my Delphi IDE 'peeking' example) but it will only list the various executables and DLLs, together with all the routines exported from each DLL.

With the PDB file available, you'll see that it's possible to expand each executable in order to show the various source and header files that were used to build it. You can then 'drill down' (don't 'ya just love American techno-jargon?) to see the individual classes defined within each C++ file, and if you reach for your handy Black & Decker once more, you'll see the individual methods inside each class. At every level of the hierarchy, check boxes can be used to enable or disable logging of that part of the code.

If you select an individual method or procedure (BugTrapper does not insist upon the use of C++!), then you can view the source code of the method in the top-right hand pane. Here again, each individual source code line of the method is 'checked', and you can specify which source code lines you're interested in. As with (for example) setting breakpoints in ordinary debuggers, you may notice that checkboxes only appear beside source code lines that actually result in executable code.

Finally, the bottom-right pane enables you to set up logging of information relating to specific variables. If you've clicked some source code lines in a method, then this window will display a list of all the variables that are potentially in scope for those source lines, including the intrinsic 'this' variable within the context of C++ methods. Further-

more, this window enables you to set up logging of one or more global variables. Because the MFC application framework has a large number of associated global variables (and the less said about that, the better!) MuTek divides up the list of available global variables in an alphabetic manner. For example, you check a small 'P' checkbox in order to see all the global variables beginning with the letter P.

You will notice that if you don't select any source code lines in the source pane, no variables will be displayed in the variable pane. This might initially seem odd but – again – it's important to remember that this isn't a conventional debugger, and we're not setting up 'watchpoints' on program variables. Rather, we're tagging executable source code lines that (when executed) will result in entries in BugTrapper's log file, and for each of those entries we're indicating what variables should have their values recorded at the same time.

Execution log

Figure 3 shows what a BugTrapper execution log looks like, after running a session with full debugging information available. As you step through the various logged call entries in the left-hand pane, you can see the relevant source code, and the state of each variable that you've asked to 'watch'. In the case of C++ class variables such as 'this' and others, you can expand the variable to see the value of individual member fields within the class. Although it's not shown in Figure 3, there's also an option to display the time when a function is called, and the time it returns, making it possible to track down execution bottlenecks in lengthy operations.

With the execution log visible in BugTrapper, you can use the various navigation keys to move backwards and forwards in the 'recording' of your program's execution. If your application is complex, you'll often find yourself in a situation where you *think* you might have located the problem but you're not sure, and wish to investigate other places in your code. To cater for this eventuality, BugTrapper provides a bookmark facility whereby you can place a named bookmark against a certain place in the execution log, making it very easy to return to that point. If you do use bookmarks, BugTrapper places a waving flag animation against that particular point in the log, which is perhaps a little over the top – especially if you end up setting lots of bookmark positions.

Incidentally, if a program error occurs while you're using BugTrapper, tracing is automatically stopped and any function calls that didn't actually return (ie they were handled by the exception mechanism inside Windows) are highlighted in red. Additionally, you can view a stack trace of the functions that were active at the time of the crash. You

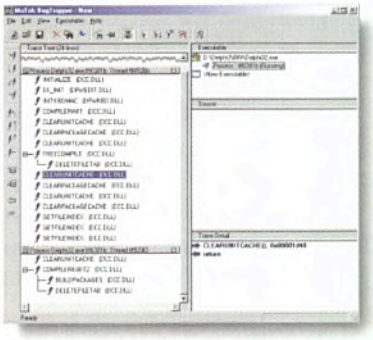

Figure 1 – This is the sort of trace that you can get from BugTrapper when you don't have access to any debug information. The jagged bitmap at the top left of the diagram indicates that I interrupted the execution trace part way through.

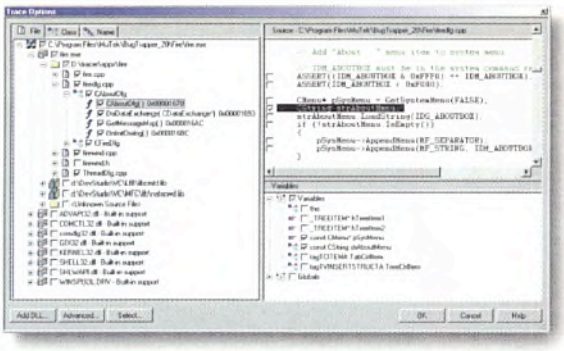

Figure 2 – Here's the Trace Options dialog when working with full debug information. As you can see, a full hierarchical view of the project is provided, which goes right down to the level of individual source code lines and local variables within each C++ method.

can move backwards and forwards through the stack of active functions and – for each function that's 'on the stack' – you can see the state of all its local variables. This will work even if you didn't specifically elect to add those particular variables to the trace log. As you can see, this facility alone makes it possible to quickly nail a pernicious bug.

Remote control debugging

What we haven't discussed so far are remote debugging scenarios. I mentioned at the outset that BugTrapper will work with non-debug executables, and it is capable of providing diagnostic information from applications that are out in the field. This is obviously very important; particularly in those – all too common situations – where an application works fine on your (the developer's) PC, but dies a horrible death on the end-user's machine.

In order to understand how remote debugging works, let's briefly introduce ourselves to some of the terminology that MuTek itself uses. What we've been looking at up until now is an *online trace*, an executable trace that's created with respect to a running executable. BugTrapper also supports the idea of an *offline trace* – a trace file that's created remotely at the end-user's site and subsequently used by the developer to analyse and locate problems with the application's execution.

It should be obvious that we don't want to supply end-users with program executables that contain debug information; not only would this vastly inflate the size of the program files, but it would make life easier for hackers who want to fiddle around inside the innards of our code. Consequently, the PDB-based scenario that we've examined up until now isn't going to be appropriate.

Let's suppose that some customer phones up and explains that if he does X, Y, and Z, then he gets a GPF. This should (hopefully) suggest to you whereabouts in the code the problem might be occurring. With BugTrapper running and the executable loaded, you first set up tracing options just as if you were about to perform an online trace on your own machine. In other words, set up which DLLs, source files, classes, methods, etc, you wish to be traced. When you're happy with the result, you can then generate a special TCI (Trace Control Information) file, which encapsulates all the options you've specified. The TCI file is typically very small (much smaller than the program's PDB file would be). You post or email the TCI file to the customer along with a special program called the BugTrapper Agent. This Agent is a small (approximately 440 KB) standalone utility that the end-users run at their site. There, the Agent generates a LOG file that (back at the ranch) can be used by the developer to step through the execution of the program's code just as if the trace had been created locally.

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The Agent utility dumps trace information to the log file when various events occur:

- If and when the application crashes.
- When the Agent utility is exited.
- When the application being traced exits.
- Whenever the user presses the Dump button in the Agent program's window, which they might do whenever aberrant program behaviour is observed.

Additionally, the end-user can use a special 'Dump By Timer' setting to dump information from the Agent utility to the log file at predetermined intervals which range from once every 0.2 seconds to once every day! The log file generated by Agent is conceptually arranged as a ring buffer, which means that once it gets full, the oldest data in the buffer will be replaced. MuTek does point out that system performance will be adversely affected if you use timer-based dumping and go for a very fast dump rate.

Agent will even allow the end-user to trace the execution of multiple versions of the same application at the same time! As seasoned developers will no doubt appreciate, many weird bugs only show up in unusual circumstances, and if your end-user complains that running three instances of your application makes everything go pear-shaped, you can still use Agent to retrieve useful trace information, with each separate process appearing as a distinct part of the log.

The end-user can optionally insert comments into the log file, and BugTrapper includes a utility for converting `TCI` files to and from text files in order to facilitate editing, the idea being that – if you're making very minor changes to an executable – you can tweak a given `TCI` file rather than generating a new one from scratch.

BugTrapper includes a system information dialog that provides such information as processor type, number of processors, display resolution, installed RAM, virtual RAM, the version of Windows (although it erroneously reports Windows 98 as Windows 95), environment variables, and a list of all the logical drives, together with their filesystem types, capacities, and the amount of free disk space for each. In addition, it contains version information on the different Microsoft DLLs that are referenced by the software being traced – this is particularly important when dealing with (for example) the multitudinous versions of `COMCTL32.DLL` that are out in the field.

If you're performing an online trace, then this relates to the PC in front of you. With an offline trace, the system information relates to the remote system where the execution log was created – a very nice feature.

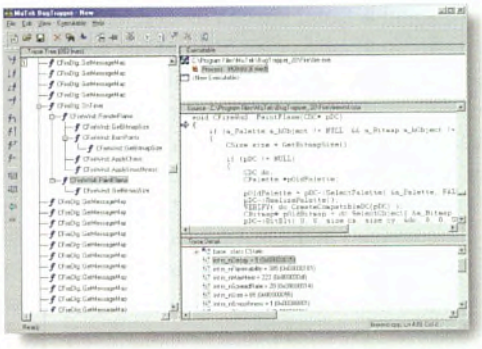


Figure 3 –The resulting execution trace gives a detailed 'flight recorder' view of what's happening inside your application. At any point, you can step backwards and forwards through the program execution, examining the state of any local and global variables that you've elected to examine.

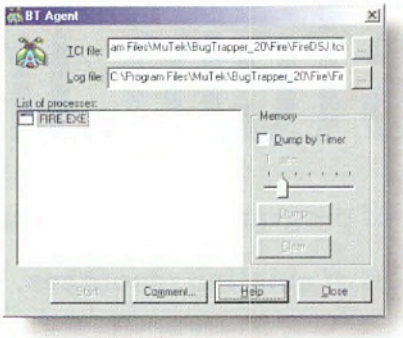


Figure 4 – BugTrapper Agent is a small, distributable utility that's supplied to end-users. Used in conjunction with a .TCI file and the executable being debugged, it can produce a .LOG file that – back at the developer's site – provides the same detailed debugging information as if the program had been executed locally.

Time will tell

A couple of years back, I wrote a generic user-survey program for a magazine that has appeared on countless cover disks and been used to gather end-user data from tens of thousands of readers. As luck would have it, just the other day I received an email from an irate reader who was complaining that the program immediately keeled over on his machine. This program was written in Delphi and (as you may know) Delphi stores individual forms as resources within the executable. Apparently, whenever this chap tried to run the program, it instantly raised a 'Resource Not Found' exception, complaining that the needed form resource wasn't present. That same month, the program had been distributed on a cover CD received by numerous others, and this was the only person who had a problem! It should go without saying that I didn't believe for one moment that the missing form resource had fallen off this one CD! Rather, the error points to some sort of subtle incompatibility between my Delphi application and that particular user's Windows installation. But what?

Alas, BugTrapper doesn't currently support Delphi, but if it did, you can rest assured that I'd be sending a `TCI` file and a copy of the Agent utility to the user in question! (Incidentally, if you're worried about your end-user getting to grips with Agent, MuTek encourages you to photocopy chapter 4 of the manual, which specifically relates to the care and feeding of Agent). I'm trying to coax MuTek into producing a Delphi version, but time will tell...

The exact price you pay will depend on whether or not you want the ability to debug applications at user locations; if you do, BugTrapper can be quite expensive, but then again, if the client with the intractable problem lives in Tibet, investing in a copy of BugTrapper may be preferable to the prospect of an on-site visit! ■

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 at djewell@cix.compulink.co.uk.

Thanks to System Science for providing the review copy. BugTrapper is distributed by System Science, Dextera Software, and Grey Matter (see http://www.systemscience.co.uk, http://www.dexterasoft.com, and http://www.greymatter.co.uk). Prices start from £425 for BugTrapper Lite going up to £2,145 for the remote debugging version and unlimited licence to distribute BugTrapper Agent along with your product. The MuTek website is at http://www.mutek.com.

System integration not

The world of programming is changing; increasingly work involves the integration and combination of existing resources. Peter Collinson looks at the important role languages such as Tcl can play.

As I write, I've just returned from the 25th Usenix Conference. Usenix, an organisation for Unix users and developers, has been going for some 20 years and manages to keep re-inventing itself. The conference was held in Monterey, California, where it was unseasonably cold. I always feel cheated when I step off the plane and it's a few degrees colder than the bottom right hand corner of England, where I live.

John Ousterhout, who is now the CEO of a company called Scriptics, gave the keynote talk at the conference. Previously, he worked for Sun, and before that was a professor at the University of California, Berkeley where he invented the Tool Control Language (Tcl) as an academic exercise. The success of Tcl has surprised him – he was more concerned with operating system design while at Berkeley (and not Unix, I should say). Tcl brings us back full circle: Ousterhout started Scriptics to promote Tcl. Scriptics is one of the new wave of software companies based on Open Source, in this case, of course, Tcl and its GUI toolkit Tk.

I did an article about Tcl and Tk some years back (*Tcl/Tk*, EXE, November 1993) just at the point where it was aiming for portability, migrating from the Unix platform onto Windows. (More Tcl coverage has appeared in the March 1996, April 1997, and November 1998 issues.) I've always liked Tcl, although I refuse to follow the author's practice of calling it *tickle*. The language is often described as 'Forth done right'. One of its characteristics is simplicity; it's an easy language to read, understand what is happening, and make that tiny change in the script that you need. I contrast this with Perl, where I think that the entry level is high – you need to know a lot before you are confident that any change that you make is safe.

Ousterhout's keynote was interesting. He started from the thesis that a considerable amount of software development these days is actually integration of extant software. Few people sit down with an empty screen and create an application from scratch; a lot of new work is built from existing resources, adapting them to some current need. Most work today involves combining access to different applications, data sources and sinks, and uses stock components and protocols.

Connecting to internals

We are in the midst of quite a shift in how things are being programmed. Of course, the Web is driving a lot of this development. In the end, I am sure the Web will encourage all companies to make some part of their internal databases visible to the outside world. The Web has changed greatly in the last two years as we travel down this path. Websites that were simply product brochures have become websites that sell products directly to the end user. Currently, sites that sell products are often maintained separately from the internal databases used to run the business. The next obvious step is to connect the internal database of the business directly to the Web.

In fact, my web company, Canterbury Web Services, has just completed this step for the used-car sales of a local company, Barretts of Canterbury. Barretts has used an integrated database system to run its business for several years, and this system has been persuaded to generate a CSV-format report containing used-car information. The report is uploaded into a relational database, which in turn drives a website that displays the latest used-cars that Barretts has on offer. The system has had conspicuous success; Barretts has sold a used-vehicle to someone who is living in the Caribbean and is moving back to the UK.

To me, the human interfaces to the used-car system feel 'right'. Essentially, we have placed control of the website into the hands of the people who create the basic information. The staff that acquire the used-cars inside the various Barretts sales departments enter vehicle details into their own system, for their own internal business reasons. However, some of these details eventually appear on the Web. We've handed the basic job of information creation to the people 'on the ground'. As a side effect, the same information is used to derive the printed adverts that appear in the local papers.

Actually, not much work was needed to create the used-car system. There's a script that reads the CSV file and verifies its contents, the information is then simply slapped into a relational database, and we provide the public with access to the used-car list over the Web.

GUIs

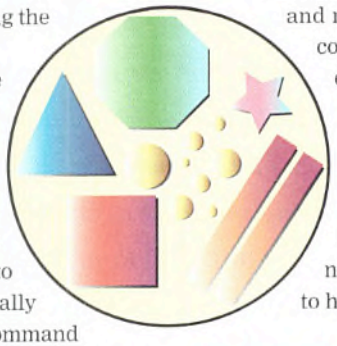
The Web is not the only application area that's driving the shift towards systems integration. Initially, Tcl became popular as a tool that would provide graphical front-ends to extant Unix commands. Tcl's Tk GUI toolkit has been ported to Perl and can now be used from both languages – Tk has been, and still is, used to build GUI front-ends to command line utilities or to interface with subsystems where the primary method of data change was a text editor (like the Unix password database). A prime example of this trend is Brent Welch's `exmh` program that provides a graphical MIME-compliant front-end to the Unix-based Rand MH mail system. More recently, Linux has contained several system-control GUI applications that owe their existence to the Tk toolkit.

Again, the approach 'feels' right. In many cases, the GUI is front ending what is essentially a legacy application, in which users have a personal investment. For example, I have years of stored mail in my MH database, and I like the way that the old mail is stored because it integrates well with other Unix tools. I don't want to have to change this, but I am happy to have a new interface to access the mail using mouse clicks.

Also, I find there is a benefit to retaining the old interface. I am still able to use the 'old' command line MH mail reading commands when I am logging in from a `telnet` or `ssh` session on the busy Internet. Using linuxconf to perform some system management task on Linux doesn't preclude the use of other editing software should I wish to do so. The

re-creation

ability to perform real tasks on the machine while using the simplest form of connection is a win.



Commands that are invoked via the command line interface allow easy automation via scripting languages such as the Unix shell, Perl, or Tcl. Pure GUI applications are often fine for one-off jobs, but rarely scale easily. Have you tried using an off-the-shelf Windows tool for converting 1,000 Jpeg files into GIF format or increasing the compression ratio on the Jpeg files to reduce their size? I've tried. It's really slow and generally dies. I've never succeeded in creating a really useful command script from the 'scripting tools' built into a standard Windows application. The OLE stuff doesn't seem to work well when you put it into a loop. Unix based command line tools can do this type of job with ease, you essentially create a small integration script that combines the tools that you need and that's it. And, of course, this ease of use is precisely why these Unix tools have been ported into Windows.

I don't want to give you the impression that script-based GUI interfaces always farm out the 'hard' things to other commands. This is not the case. For example, the `exmh` mail interface handles all of its own message composition and viewing. It's even got its own HTML processor and so deals well (but slowly on my elderly machine) with the current trend of sending mail in HTML.

The need for integration

Ousterhout identified three other application areas that are pushing the need for integration tools: embedded devices; the consolidation of various computing systems within one enterprise, for example the communication between different departments of a hospital; and finally, component frameworks like COM, Corba, and EJB (Enterprise JavaBeans). These integration applications are not handled well by 'traditional' programming languages. The problem for integrators is not how to create algorithms and data structures but to connect things together, to coordinate activity, and provide customisation.

Integration often involves rapid and unpredictable evolution. Requirements often change once the software is in place. The systems need to adapt quickly to changes in components that are perhaps upgraded for internal needs without paying great attention to the needs of the interconnection system.

This integration is often programmed by what Ousterhout called 'the less sophisticated programmer', which should mean 'the user' really. However, all programming requires some level of 'trained' thinking; programmers carry around a legacy of all the programs they have written, and a history of 'how to do things'. It's easy to forget the zillions of things we take for granted. After all, educators discovered in the 70s that programming is a skill and not everyone is good at it. Even so, on some level, sophisticated programmers will always want to operate at a 'less sophisticated' level because it reduces the 'need to know'. I like to integrate 'black boxes' together because I don't have to understand how each box works to create the target system; I can just deal with the inputs and outputs of each section.

John Ousterhout's view is that traditional system implementation languages do not meet all these requirements very well. These languages grew at a time when most programs were created from scratch. They sprang originally from the need to replace assembly language programming by something that was easier to use, while maintaining the efficiency of assembler language code. The early system implementation languages have evolved to employ methodologies that are designed to help the programmer eliminate mistakes in the program itself.

Traditional languages tend to be compiled into a binary form, and most of the languages concentrate their checking at compile-time. To help the compiler perform the checking efficiently, languages have acquired strong variable typing, and require the predefinition of variables and APIs. There is rarely any runtime checking, so we are reliant on the programmer not to write code that causes an array bound to over-step the mark or write indirectly via a pointer to memory areas that shouldn't be updated. The blue screen of death is a testament to how often this confidence is misplaced.

The scripting solution

The solution to these problems is to use a scripting language for application integration. Scripting languages are dynamic because they are interpreted – a quick change to the script is all that is needed to modify applications in the field. And scripts can easily be changed to handle unplanned growth.

In general, scripting languages are based on string handling or are weakly typed. All variable values are held in strings and conversions between numeric values and strings are made automatically depending on context. This simplifies programming and allows code to be reused more easily.

Actually, Tcl is simpler in this respect than Perl. One of Perl's traps for the unwary (a Pooh trap for Heffalumps) is that it tends to use its operators to imply context for variable evaluation. If you wander into Perl from being a C programmer, it can take some time for this notion to sink in. For example:

```
$a = 1;
$b = "1";
if ($a == $b) {
  print "yes\n";
}
if ($a eq $b) {
  print "yes\n";
}
```

When run, the program prints:

```
yes
yes
```

We initially define `$a` to be the numeric value one, and `$b` to be the string `1`. Both tests succeed, the difference being that the first test does a numeric comparison of the values of the variables, and the second test executes a string comparison of the variables. The tests are equivalent for numeric values, but things can get less than useful if you use the numeric comparison on a variable that contains an alphabetic string value.

However, such a test would not work properly *silently*; the program would not crash and burn. You may regard this as a bad thing (nothing is telling you that your program is incorrect) or a good thing (your program will soldier on regardless). I find that I discover these bugs when testing – usually a test that you expect to succeed under certain circumstances does not operate as planned. On balance, the notion that the program should continue is a strong feature of programming with scripts. I touched on the issues of error handing in my December 1998 article for EXE (*The art of errors*). I

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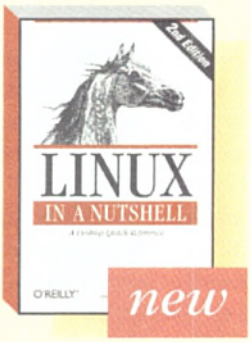

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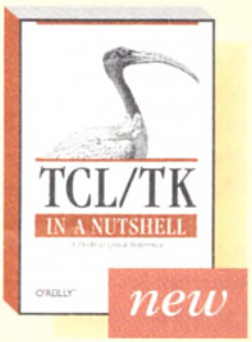

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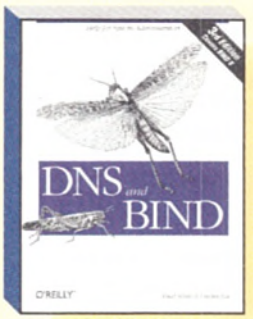

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was finding with Perl that scripting languages tend to generate fewer errors than programming in C.

Another positive feature of scripting languages is their ability to supply sensible defaults at runtime. Ousterhout showed this with a one-line Tk statement:

```
button .b -text Hello! -font courier \
   -command {puts Hello}
```

This creates a pushbutton containing the text 'Hello!' in a courier font. When pressed, the button runs a command, which in this case prints the text 'Hello'. He compared this single line to the 28 lines of C++ that is needed to generate the same button using MFC. It's shorter because there is little or no language 'goo' needed. And there is a bunch of defaults for the button that are established by Tk, including the size of the button, the font, the size of the font, and so on.

Portability

Actually, when I tried Ousterhout's original example on my Unix machine, I found that it didn't work. It failed because the `-font` parameter was supplied with an argument that was incorrect on my X11 Window system. Scripting program portability can be an issue because the underlying APIs that they use to achieve certain effects can vary from platform to platform. In some ways, this runs counter to your general expectations of portability of source.

Perl suffers greatly from the problem of source compatibility. First, the basic language changed between Perl 4 and Perl 5. In my view, Perl 5 is a usable language, Perl 4 was not. However, it's now hard to determine what version of Perl you will have on any particular platform. For example, on BSD/OS, Perl 5 is called `perl5` and the `perl` command runs Perl 4, because BSDI has some sizeable legacy applications written in Perl 4. On my Red Hat Linux box, the `perl` command is Perl 5, and Perl 4 is not available. (Hint: type `perl -v` if you are unsure what version of Perl you have.) Tcl has tended to manage the proliferation of different versions somewhat more gracefully.

There are also problems with Perl's libraries. It's too easy to create an application on one machine, and arrive at another machine to find that some crucial libraries have not been installed. I get round this by having my own library and importing anything that I need into it. Perl attempts to handle library *versions* sensibly. If the script is coded properly, it can detect that the target machine has an old library version installed, so programs can be written that cope with the ongoing problems of code development.

However, if your product needs to install and run on different platforms, then you may sleep better if you ship the complete scripting language version with the product. This is what EWS does with its Excite search engine. When you install it, you'll find it installs a private version of Perl designed to support the Excite infrastructure with a known base.

When programming in a scripting language, you are often generating a targeted system and cross-platform portability is not a problem. Well, you think this is the case at design-time. I tend to program defensively, putting constants into variables at the top of the file so that I can change them later. On the whole, you can create portable applications in scripting languages, and create them so that they are perhaps more portable than an equivalent program in a traditional language.

Critics of scripts

Scripting languages are mostly criticised because the programs run more slowly than the compiled binaries from traditional languages. This concern was more valid some years ago. Machine speeds have increased dramatically – computers today are 500 times faster than they were in the 80s (although it can seem that this speed increase has not been passed to the user in some circumstances). And they are loads cheaper. In the 50s and 60s, machines were perhaps 20 times the annual salary of a programmer, now they are 1/20th of a typical annual salary. The real trick with scripting languages is to ensure that the computationally-expensive operations are done in an underlying component, either a library or a standalone program.

It's often said that it's harder to find errors in scripts because there are fewer compile-time checks. Ousterhout said that better runtime checking outweighed this. And, as I've said above, scripting languages fail 'safe'. I remain somewhat unconvinced by these arguments. You have to 'take a view' as the lawyers say. I've certainly spent several hours chasing missing brackets in both Perl and Tcl. Perl's compile and check options help considerably in ensuring that you have created consistent syntax. But you can still be fooled into thinking that your program works, only to find that it dies at runtime when following some specific path through the code because you've not typed the name of a routine properly. You do need to test scripting language programs pretty exhaustively to ensure that all the code paths have been used.

Finally, scripting languages are 'hard to maintain'. The defence here is that there is less code to read. Again, on balance, I find Tcl programs much less frightening to change than Perl code. Maintenance usually means changing something, and Tcl encourages programmers to create small well-defined modules that are easy to understand. Your 'need to know' on the whole program is probably less with Tcl than it is with Perl.

The future split

I believe Ousterhout's contention that there is a shift in the way that programs are being written. I find myself writing more and more integration scripts for one thing or another. His view is that scripting languages are moving upscale. They were originally used just for small applications and are now being found in larger and larger systems, such as server applications (particularly on the Web), software products, and enterprise applications.

Scripting languages have improved dramatically over the years. They've improved in facilities *and* execution speed. For example, Tcl now uses similar byte encoding technology to that found in Java, both to obtain compilable scripts and optimise inner loops.

Ousterhout's view was that the world of programmers is about to split into 'expert programmers', who will be responsible for generating the components and base applications, and 'domain experts', who will be responsible for integrating the parts together to create the final applications and for providing local customisation of the products. The domain experts need not be particularly skilled programmers; they will have the ability to work with the users and generate the solutions that they need. I guess we shall see. ■

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Further reading

You can find more on Tcl on the Scriptics site, *http://www.scriptics.com* (thanks to John Ousterhout who made his slides for his talk available to me). Tcl and Tk now run on Windows of various flavours, and there is a plugin available for browsers. The Usenix site is *http://www.usenix.org*. The Barretts site is *http://www.barrettskent.co.uk*.

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Raising the standard

Francis Glassborow continues his look at reporting problems with the C++ Standard, and examines cross-casting.

Having decided that you have found a defect in the C++ Standard, what should you do with it?

The first thing is to check that it has not already been reported. The easiest way to do this is to visit either *http://www.dkuug.dk/jtc1/sc22/wg21/* or *http://www.comeaucomputing.com/iso/* where you will find complete listings of all issues raised. For convenience, these are separated into two lists: core and library. The lists include any proposed resolution of an issue where WG21 and J16 (the Standard committees responsible for C++) have reached a tentative answer. If you are concerned about any such answer, please raise the issue as soon as possible as you would for reporting what you believe is an unreported defect.

Having decided that you have something to report, you need to formulate it in terms that others can work with. Marshall your facts according to the following guidelines:

1. The submission must contain a single DR (defect report) on one topic, although it might involve more than one section of the C++ Standard. The description must be clear enough so that it can be evaluated.
2. The submission must concern an error, inconsistency, ambiguity, or omission in the Standard, or something similar. It must not propose a new feature or a substantial change in the language definition or library interface.
3. The submission must refer specifically to the final published Standard, not to any previous draft version. See the FAQ for `comp.std.c++` (*http://reality.sgi.com/austern_mti/std-c++/faq.html*) for information on how you can get a copy of the standard.
4. The submission must identify relevant sections of the Standard by section number and mnemonic designation. Paragraph numbers are also helpful.

No particular format is required, as long as the guidelines above are followed. The submission should be *plain* Ascii text, and the language should be English. (Your written English need only be understandable. DRs will not be rejected just because of incorrect grammar or spelling.)

You are now ready to submit your possible DR. The simplest way is to send your submission to the Usenet newsgroup `comp.std.c++` (or by email to its moderators, *std-c++@ncar.ucar.edu*) with 'Defect Report' as the first two words of the subject line. Alternatively, you can send it to me (in a machine-readable form) for consideration by the BSI C++ Panel who will submit it as a UK DR if they agree that it is a defect.

You may also submit it to the BSI C++ Panel if you wish to appeal against a rejection by the moderators of `comp.std.c++`. I hope this will be a rare occurrence because we already have plenty of work to do, but as the second largest National Body (to the USA) in C++, the UK has volunteered to act as a court of appeal.

I can assure you that if you take the trouble to submit a potential DR, we will make the time to consider it and add any necessary refinements. You will get a response, but sometimes that may take a little time.

Casts revisited

I have just had an email from Kevlin Henney correcting me on one point and extending another (see *Casts and conversions*, June 1999). He correctly points out that static checking of `dynamic_cast` is impossible (I think it can be done at link time, but certainly no earlier). To see why, we need to have a look at what Bjarne Stroustrup calls cross-casting. Consider the simple inheritance diagram shown in Figure 1.

Casting from either `Base1` or `Base2` to `Derived` is called a downcast. The `dynamic_cast` was, in part, introduced to ensure that such casts could be checked at the only stage where that is possible: execution time. You have no general way of knowing the dynamic type of a pointer (or reference) earlier than execution time. Clearly, downcasts can be statically checked for being possible. However, `dynamic_cast` supports safe cross-casting as exemplified by the following code (based on the inheritance diagram shown):

```
void foo(Base1 * b1_ptr) {
   Base2 * b2_ptr = dynamic_cast<Base2 *> b1_ptr;
// which will result in a non-null pointer if, for
// example, b1_ptr points to an instance of Derived.
   if (b2_ptr) b2_ptr -> baa();
}
```

assuming that `baa` is a member function of `Base2`.

Cross-casting is very important to the mixin style of programming. The price paid is that a `dynamic_cast` cannot be, even partially, statically checked. A determined programmer can relate any two classes by multiply deriving a new class from both of them. Hence, the compiler is required to assume that all user-defined classes are potentially related by cross-casts.

The other point Kevlin made was to remind me that the commonest use of `const_cast` in quality code is for interfacing between `const` correct code (yours) and non-`const` correct code (legacy, API, third-party library, etc).

At least one C++ guru thinks that you should not use a `const_cast` to add `const` but only to remove it. While it is true that you do not need a `const_cast` to add `const` qualification (well there are some very subtle issues related to adding `const` to a multi-level pointer but I will leave that well alone for now), I believe that it adds information as to your intention. For example:

```
void foo(string &);
void foo(string const &);
int main(){
   string greeting ("Hello");
   foo(const_cast<string const &>greeting);
   return 0;
}
```

should make it clear that I have no intention of changing the underlying type of `greeting` – I just wish to select the correct member of the overload set for `foo`.

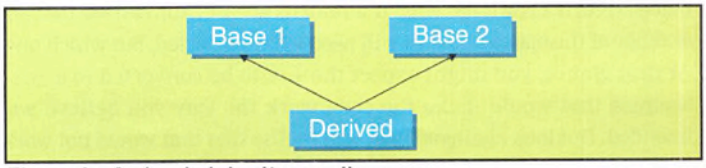

Figure 1 – A simple inheritance diagram.

From an earlier problem

In my June column, I wrote (for the previous month's problem):

The problem is with that `uppercase(hello).data`. *Remember that this is exactly equivalent to* `(&uppercase(hello))->data`.

One astute reader (John Skelton) took issue with that statement. And after considerable thought, I find that I have to agree with him, but the issues are subtle. The C Standard explicitly allows you to apply the dot operator to an rvalue (remember that is what we colloquially call a value) and the result will then be an rvalue. However, it does not allow you to take the address of an rvalue.

While it is true that if something of the form `(&x)->y` is equivalent to `x.y` if `x` refers to an lvalue, it is not true if `x` is an rvalue.

Remember that rvalues do not have addresses, so in the context in which I was using the dot operator the result should be a naked (ie without locality) array of `char` whose address needs to be taken in order to pass it (by reference) as an argument to `printf`. I think that taking the address of an rvalue is undefined behaviour in C (though it is hard to pin down such obscure things). That, of course, means that any implementor can define it to do the 'right thing'.

Last month's problem

Comment on the following code snippet:

```
if (fn(<argument list>) == true) dosomething();
```

(C programmers should replace `true` with `TRUE`.)

For comparison, consider:

```
if (isprime(value)) tofile(value, results);
```

The form of these two statements is very similar, but do you have any doubts as to which is more useful to the human reader? Nonetheless, I guess that many conservative programmers would be very critical of the second statement.

Some will want to have a go at my use of all lower case names and would argue that I should have written `isPrime` or `is_prime` on the grounds that these are more readable. I wonder. Is it not just that these alternatives have vociferous proponents? The ACCU Disabilities Officer called my attention to the difficulties caused by using case to distinguish variables; those who have to rely on screen readers will entirely miss the nuance. If you look at classic C, as exemplified by the Standard C Library, you will find such functions as `isdigit` rather than a trendy `isDigit`. After following the trend for a decade, I have recanted. If only the proponents of Hungarian Notation would recant as well, we might have readable code as the norm.

Meaningful variable names were only an added gloss to the original problem, which is actually far more serious. We can deduce from `(fn() == true)` that `fn` returns a value that can be compared with another value represented by `true`. Because C lacks a boolean type, the requirement is often simulated via two preprocessor identifiers (`TRUE` and `FALSE`). However, these are simply alternative ways of representing 1 and 0, and it is those underlying values that will be seen by the compiler. In other words the control expression will only evaluate to `true` if `fn` returns a strictly boolean value.

C++ programmers will delightedly point out that C++ has a boolean type. However, I suggest that they think again. All will be fine if `fn` does indeed return a `bool`, but what if it returns an `int`? You can see that one or other of the operands of `==` will need to be converted, but which one? At first glance, you might expect the `int` to be converted to a `bool` because that would make the code work the way you believe was intended. But look again and you will realise that that would not work. None of the built-in comparison operators take mixed type operands and so, for consistency, mixed values will be promoted and you will get the same behaviour that C provides. If only the designers of C++ had had the courage to omit automatic conversions from `bool` to integer types.

The result is that writing `(fn() == true)` is fraught with unexpected consequences. Of course, this kind of problem was well known to C programmers and they advocated such alternatives as: `(fn() != false)`. This works because only a single value from other arithmetic types is treated as false. However, it introduces undesirable complexity in your programming. Negative statements (whether in natural language or in source code) are exceptionally prone to error and should be avoided.

For some reason, the natural style (of omitting the comparison) fell out of favour. You would probably criticise the following English sentence: 'If it is true that the value of the return from a function is true, then do something' and suggest 'If the value of the function is true, do something' as being equivalent and less convoluted. Why not advocate the simpler formulation in source code?

If you give your functions (and variables) meaningful names, you will find that your code is self-descriptive. One result is that you can write simpler expressions that behave the way you intend.

Finally, on the issue of code layout, my guiding principles are ease of reading and expression of intent. Generally, I avoid single entry lists in English. I apply the same rule in source code. Of course, a great deal depends on your prior experience, but I find:

```
if (isprime(value)) tofile(value, results);
```

easier to read than:

```
if (isprime(value))
{
  tofile(value, results);
}
```

However, this is a very minor detail not worth going to war over. Of course, being English, I would prefer to construct my code so that I could write `if(value.isprime()) value.tofile(results);` but a German programmer might not find that so close to natural language. What is important is that we have a consistent ordering for parameters across a wide range of instances. Perhaps, like the C Standard Library, I should have the file as the first argument.

This month's problem

What output should the following program produce?

```
#include <stdio.h>
int main(){
  unsigned char c;
  unsigned char x = c;
  unsigned char y = c;
  if (x == y) puts ("stable");
  else puts("unstable");
  return 0;
}
```

■

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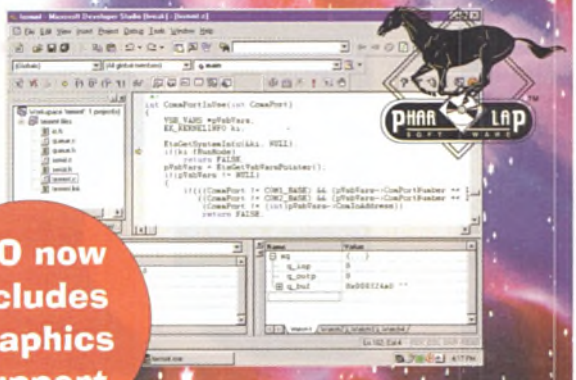

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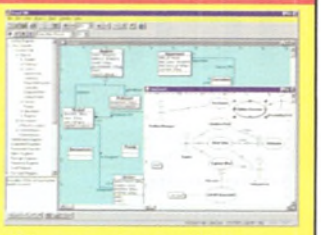

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Class war

With the use of interfaces becoming prevalent, Mark Smith demonstrates what classes have to offer the Delphi programmer.

This month, I want to look at classes – what they are, and what they give us. Before proceeding, a bit of history is in order. Broadly speaking, a common trend in the evolution of programming has been the process of abstraction, of both data and processing. In the beginning, we had simple types, strongly bound to the registers and memory locations of the computer. This was followed by the introduction of variables, records, and abstract data types. At the same time, programming languages evolved from direct instructions to the processor, through machine-oriented C and data-oriented Pascal or Basic. Today, the processing and data abstractions have combined to give us the current crop of object-oriented programming languages. C++, Java, Smalltalk, and Object Pascal are the most common, with Eiffel well worth a look. The main abstraction with which we program now is the object – we build systems from objects and think in terms of object interactions. Classes are viewed as a convenient way of categorising and sharing behaviour between objects, but classes themselves are not often viewed as a component of the running system.

How we build our classes defines how our objects behave. While the basic idea of classes inheriting behaviour and state from one another is fairly straightforward, a few issues are still not widely understood, or are often misunderstood by programmers new to Delphi. Chief among these is the relationship between static and virtual methods: which to use, and when to use them.

Dynamic, static, or virtual

A method can be declared with a `dynamic`, `static`, or `virtual` directive. If you don't give a directive, a method is assumed to be static. The best way of explaining static and virtual methods is by comparing them to see how the declaration affects the behaviour. Listing 1 shows two classes and their method implementations, and Listing 2 shows some code to illustrate the point. The procedure `AStaticMethod` is declared with no directives (and is therefore static), while `AVirtualMethod` is declared to be virtual, and is overridden in the descendent class `TChildLevel1`. The `DoVirtualClick` and `DoStaticClick` shown in Listing 2 both create a single object of type `TChildLevel1`, which is a descendent of `TBaseClass`. The child is assigned to an object of the ancestor type, and the same method is called, for both the ancestor and the descendent. Note that the variables `Base` and `Child` refer to the same object. Calling `DoVirtualClick` results in the messages 'TChildLevel1.AVirtualMethod' being shown twice. In contrast, calling `DoStaticClick` results in the messages 'TChildLevel1.AStaticMethod' then 'TBaseClass.AStaticMethod' being displayed. The difference in the two results is the key feature here. A virtual method is one that you intend to change the implementation of in descendent classes. When you declare a method as virtual, you are instructing Delphi to check at runtime and find the last class in the hierarchy that re-implements the method by overriding it. Clearly, this checking has a space overhead (four bytes), and takes considerably longer than simply calling code at a known address in memory. Just how much longer depends on a lot of factors, but chief among them is that (according to people who know about such matters) virtual methods are difficult to turn into parallel instructions, while static methods are easy.

Dynamic methods have the same behaviour as virtual methods, but the information for dynamic methods is stored in the class in a compressed form. Dynamic methods save a little memory at the expense of speed of calling the method. A quick search of the VCL reveals that most dynamic methods are in code that responds to user actions, where performance is less of an issue, and they are usually methods that one would override only infrequently. This can be taken as an indication that dynamic methods should probably be avoided in most applications.

The VCL, collections, and classes

We usually think of classes as being a mould or template from which we build our objects, and it's easy to forget that a class is itself something that you can program with. We can define variables that refer to classes rather than objects using the `class of` construct. We can then define variables that hold a reference to a class. The first example of a class type in the VCL is `TClass`, which is able to hold a reference to any class descended from `TObject` (which means any class, effectively).

It is instructive to see how the VCL uses classes and class types, or fails to do so. First, let's look at an example of the VCL failing to use class information. Most applications use the `TListView` and `TTreeView` classes to show list and hierarchical information. Often, it would be useful to tie together the information presented to the user and the object that the displayed item represents. The problem is that VCL classes don't let you specify the kind of item you want to use to build the list-view or the tree-view. There are virtual methods `CreateListItem` and `CreateNode` that actually create the nodes and items displayed. You can override these methods, but you need to know about them first, and they are buried in a module of nearly 20,000 lines and they are not mentioned in the Delphi help. A far bet-

```
type
   TBase = class
   public
      procedure AStaticMethod;
      procedure AVirtualMethod; virtual;
   end;

   TChildLevel1 = class (TBase)
   public
      procedure AStaticMethod;
      procedure AVirtualMethod; override;
   end;
...
procedure TBase.AStaticMethod;
begin
   ShowMessage ('TBase.AStaticMethod');
end;

procedure TBaseClass.AVirtualMethod;
begin
   ShowMessage ('TBase.AVirtualMethod');
end;

procedure TChildLevel1.AStaticMethod;
begin
   ShowMessage ('TChildLevel1.AStaticMethod');
end;

procedure TChildLevel1.AVirtualMethod;
begin
   ShowMessage ('TChildLevel1.AVirtualMethod');
end;
```

Listing 1 – Class declarations.

ter solution would have been to have a public property on the list-view and tree-view that let you specify a class for the items.

The `TDataset` class has the ability to create and hold nested datasets. Unlike the `TTreeView`. It accomplishes this by using class information in the form of a class type variable stored in a property called `NestedDataSetClass`. This property is not supposed to be widely used by application builders so it is declared as protected. The irony here is that in the `TListView` and `TTreeView` classes, where the user often wants to specify the class for sub-items, it is impossible to do so without resorting to inheritance to replace the default behaviour of the VCL. In `TDataset`, which is intended to act as a base class, it is easy to specify the class of the sub-item.

The `TCollection` class is a good example of the usefulness of class type variables, and is a bit of an anomaly within the VCL. The implementation of `TCollection` present in the VCL today was implemented in Delphi 3, so the original designers of Delphi did not view it as being very important in the initial conception of the product. Essentially, the modern `TCollection` is a list class responsible for the full lifetime management of the objects it contains – from creation to destruction. Its constructor takes a class type as its parameter, and all items that the collection manages are generated from this class.

```
procedure TForm1.doStaticClick(Sender: TObject);
var
   Base : TBase;
   Child : TChildLevel1;
begin
   Child := TChildLevel1.Create;
   try
      Child.AStaticMethod;
      Base := Child;
      Base.AStaticMethod;
   finally
      Child.Free;
   end;
end;

procedure TForm1.DoVirtualClick(Sender: TObject);
var
   Base : TBase;
   Child : TChildLevel1;
begin
   Child := TChildLevel1.Create;
   try
      Child.AVirtualMethod;
      Base := Child;
      Base.AVirtualMethod;
   finally
      Child.Free;
   end;
end;
```

Listing 2 – Sample code.

```
implementation

var
   FHowMany : integer;

constructor TBase.Create;
var
   InvokedByClassRef : boolean;
begin
   asm
      Mov InvokedByClassRef, DL
   end;

   inherited;
   if InvokedByClassRef then inc(FHowMany);
end;

destructor TBase.Destroy;
var
   InvokedDirect: boolean;
begin
   asm
      Mov InvokedDirect, DL
   end;
   if InvokedDirect then Dec(FHowMany);
   inherited;
end;

constructor TChildLevel1.Create;
begin
   inherited;
   FHoldsChildHowMany(+1);
end;

destructor TChildLevel1.Destroy;
begin
   FHoldsChildHowMany(-1);
   inherited;
end;

class function TChildLevel1.FHoldsChildHowMany(
                              increment: integer): integer;
const
   FChildHowMany : integer = 0;
begin
   inc (FChildHowMany, increment);
   Result := FChildHowMany;
end;
```

Listing 3 – Constructor calls and class properties.

The `TCollection` class is a good example of the usefulness of class type variables, and is a bit of an anomaly within the VCL. The implementation of `TCollection` present in the VCL today was implemented in Delphi 3, so the original designers of Delphi did not view it as being very important in the initial conception of the product. Essentially, the modern `TCollection` is a list class responsible for the full lifetime management of the objects it contains – from creation to destruction. Its constructor takes a class type as its parameter, and all items that the collection manages are generated from this class.

Classes and constructors

On the face of it, constructors are class methods. The most common form of constructor call strongly resembles a call to a class function, such as `myObject := TObject.Create`. There is another use for constructors: to re-initialise objects to their default state, without allocating any storage space. You can accomplish this by calling `myObject.Create` on an already initialised object. If you really want to know which kind of `Create` is being called, you can inspect the `DL` register. Likewise, for destructors, you can check to see if the destructor is being invoked using the `inherited` keyword. Listing 3 shows how the class `TBase` keeps track of the number of object instances that it has generated by looking at the `DL` register and storing this value in a module-scope variable `FHowMany`.

Simulating class variables

In Delphi, classes do not have user-definable variables or properties. The `TObject` class provides access to information about a class in terms of functions. The routine `InstanceSize` is a good example, giving the size in bytes of the object that the class defines. As things stand, you cannot declare class variables or class properties, though you can declare class functions that do something rather similar. The trick (or hack, you might prefer to call it) is to use a static variable in a class function. You need to control how you access this variable – in the sample code, we change the 'class variable' by incrementing it. See Listing 3 for details.

Classes versus Interfaces

Recently, we've seen a move away from classes. Programming with COM, and the movement towards component-based development, emphasises the role of object instances. In COM programming, the class of an object does not matter any more – the only concern is what interfaces the object instance supports. What an object *is* matters less than what it *does*. For many programming tasks, the object/interface-based approach is fine, but I hope this article has demonstrated that classes still have a lot to offer.

When designing a system, you can think about your objects either being instances of a class or implementors of an interface. Each approach has its own benefits – interfaces can be grafted onto any existing class as an elegant and powerful way of extending objects, but interfaces carry no information about the object implementing the interface, or the class that generated it. Classes, on the other hand, carry a wealth of information about the kind of thing you are programming with. ■

Mark Smith is a Delphi contractor. You can contact him by emailing msmitha@cix.co.uk.

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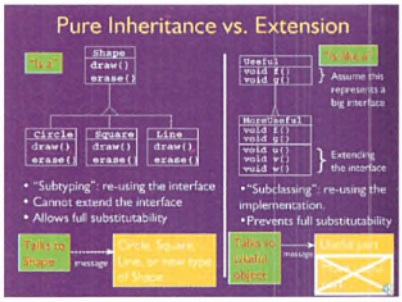

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Distributed objects

Roy Tynan works through a Java RMI server and client applet.

The three mainstream technologies that provide support for distributed object architectures are RMI, Corba, and DCOM. There is no simple answer to the question of which architecture is technologically superior or which to incorporate in a distributed-object system design. However, RMI, Corba, and DCOM all have some unique characteristics to consider in the decision-making process.

DCOM overview

Distributed Component Object Model (DCOM) was unveiled in 1996 as Microsoft's solution to distributed object architectures, and is now Corba's biggest competitor. DCOM, previously known as Network OLE, is an extension of the COM design to networked applications. Although DCOM possesses its own core network protocol, Object Remote Procedure Call (ORPC), and has major architectural differences from Corba, it successfully duplicates the powerful Corba capabilities within the Microsoft environment. Key features engineered into the DCOM architecture include language independence, integrated Windows NT security, and transport neutrality. DCOM is a proprietary solution and is well suited for the Microsoft-centric environment. If other operating systems are required in the application architecture, then DCOM is probably not the correct approach.

Corba overview

The Common Object Request Broker Architecture (Corba), developed by the Object Management Group (OMG) in 1990, enables invocations of methods on distributed objects residing anywhere on a network, just as if they were local objects. A Corba implementation employs Object Request Brokers (ORBs), located on both the client and the server, to create and manage client/server communications between objects. They allow objects on the client-side to make requests of objects on the server-side without any prior knowledge of where those objects exist, what language they are in, or what operating system they are running on. To facilitate these requests and provide ORB interoperability, the Corba 2.0 specification outlines a protocol named Internet Inter-ORB Protocol (IIOP). Corba is the logical technology of choice for truly enterprise-wide, open-architecture, distributed object applications.

RMI overview

Remote Method Invocation (RMI), integrated with JDK1.1, is JavaSoft's implementation of a distributed object design. RMI provides a way for client and server applications to invoke methods across a distributed network of clients and servers running the Java Virtual Machine. Despite the fact that RMI is considered to be lightweight and less powerful then Corba and DCOM, it still brings to the table some unique features, like distributed, automatic management of objects and the ability to pass objects themselves from machine to machine.

The client stub and server skeleton are created from a common interface object. The difference between the two components is that the client stub simply connects to the RMI Registry while the server skeleton is tied to the actual method operations.

RMI is the simplest and fastest way to implement a distributed object architecture due to its easy-to-use native-Java model. Therefore, it is a good choice for RAD prototypes and applications that are implemented completely in Java. The main issue with RMI is that it's not as robust or as scalable as Corba or DCOM solutions. The 'single-language' crutch makes it impossible for RMI to interact with objects not written in Java – like legacy applications – and prevents it from playing a more formidable role in large-scale enterprise solutions. (Note: JavaSoft has announced that it is fully committed to Corba/IIOP and has plans to make RMI IIOP-compatible.)

Java RMI and Corba

RMI is very general: it lets you call any remote method of any suitably prepared object. You can make the calls any way you like, and you can make the calls in any order. However, because the structure used is quite general, you can probably write a custom socket solution that's faster.

RMI is built on top of Object Serialisation (OS). This is simply one way of passing data around, and, like RMI, it too is quite general. You can pass any suitably prepared object over a network connection and it will show up on the other side, intact and ready to have its methods called. The same arguments about generality and efficiency that applied to RMI apply here as well. On the other hand, Object Serialisation does supply some optimisations of its own. For example in certain circumstances, when user code sends an object twice, the underlying OS layer will send the full object the first time and will send only an abbreviation the second time. This technique can save a lot of bandwidth, but remember that you can use the same technique in your code as well.

Let's consider some of the possibilities for optimisation. Let's say your applet is a game and that one of the messages sent to the client is 'the player has moved to location x, y'. If you implement this in RMI, you will be writing code to make a remote call to an object. Without actually using some kind of Socket Sniffer, we aren't going to be able to tell what bytes are being sent, but it's a good bet that the underlying RMI library will have to send at least the following things across the network: a remote object ID, a remote object method ID, and the types and contents of the arguments.

If you write your own system, you can probably get away with sending between four and eight bytes. It's not likely that anything general like RMI is going to be more efficient than that (but you never know). Of course, it all depends on what your program does. Some network protocols are rather like function calls. A Chat server, for example, might have a set of messages, each of which has a set of arguments:

```
command=say, userid=100, text="hey there everyone"
command=change_channel, userid=100, new_channel="climbing"
command=quit, userid=100
```

These messages are *so* much like function calls that RMI can be a very convenient way to implement them. Optimisation issues aside, if you write a system like this, you are likely to be doing by hand what RMI can do for you automatically.

RMI continues to evolve. The major enhancements in JDK 1.2 are *Custom Socket Types* and *Remote Object Activation*.

Custom Socket Types, bring nothing new to Java. Available in JDK 1.1, the RMISocketFactory made it possible to construct a factory to produce a socket other than that of the TCP-based `java.net.socket`. The limitation was that, once instantiated, the factory could only produce sockets of this one alternative type. Introducing the class

`java.rmi.server.SocketType` to JDK 1.2 enables the construction of an RMISocketFactory that can generate the appropriate socket type as required per-object request.

Previously with Remote Object Activation, server programs would create instances of remote objects that ran continuously. With JDK 1.2, the introduction of the class `java.rmi.activation.Activatable` and the RMI daemon `rmid` mean that remote objects can now be created and executed as and when they are needed. Programs need register only the implementation information for the remote objects and the `rmid` daemon will provide the spawned JVM instance as needed.

There are also a number of minor enhancements in JDK 1.2 that allow the following: un-exporting a remote object, obtaining the stub for an object implementation, obtaining a local object implementation from a stub, and exporting an object on a specific port.

RMI by example

The RMI architecture is based on Java interfaces. In RMI, a remote object provides a service for clients. Each of these services must be defined by a Java interface; an implementation class provides the service.

A 'Time of Day' service, provides a `Date` object that captures the current date and time. This interface defines the behaviour of the service:

```
public interface TimeServer {
   public Date getCurrentDate();
}
public class TimeServerImpl implements TimeServer {
   public Date getCurrentDate() {
      return new Date();
   }
}
```

As defined, `TimeServer` is a local service. To turn it into a remote service we must make three changes.

First, the interface must extend `java.rmi.Remote`. This is a special marker interface that tells the RMI system that the developer intends `TimeServer` to be a remote RMI service.

```
public interface TimeServer extends
      java.rmi.Remote { ... }
```

Second, all remote methods must declare that they may throw the exception `java.rmi.RemoteException`. If an error occurs while RMI is running, the RMI system will throw a `RemoteException`. Because Java forces all exceptions to be declared in method signatures, we must make this accommodation.

The full definition of the remote interface is:

```
public interface TimeServer extends java.rmi.Remote {
   public Date getCurrentDate() throws
          java.rmi.RemoteException;
}
```

Third, the implementation of the service must extend the Java class `java.rmi.server.UnicastRemoteObject`. This class provides the links into RMI that support the distributed object model. The remote implementation of the service is:

```
public class TimeServerImpl extends
   java.rmi.server.UnicastRemoteObject implements TimeServer {
   public TimeServerImpl() throws
          java.rmi.RemoteException {
      super();
   }
   public Date getCurrentDate() throws
         java.rmi.RemoteException {
      return new Date();
   }
}
```

After the interface and implementation for a remote object have been defined and compiled, the stub and skeleton files are generated. As in the Corba architectures, the RMI stubs and skeletons are the links between the client and server objects and the RMI system.

Because the stub and the server implement the same interface, they can be used interchangeably by Java code. The RMI system works smoothly with Java programs because the stub and service implementation classes show the same interface. However, behind the interface they provide completely different implementations. The service implementation provides the behaviour while the stub file implementation provides a hidden link into the RMI system.

A TimeServer example

We are ready to build our `TimeServer` service. To do this, we first compile the interface `TimerServer.java` and the implementation, `TimerServerImpl.java`. Then we must run a utility program `rmic` to generate the stub and skeleton class files. The `rmic` utility takes as its argument the name of the service implementation class (`rmic TimeServerImpl`) and will generate the files `TimeServerImpl_Stub.class` and `TimeServerImpl_Skel.class`. We then have these files: `TimeServer.java`, `TimeServer.class`, `TimeServerImpl.java`, `TimeServerImpl.class`, `TimeServerImpl_Stub.class`, and `TimeServerImpl_Skel.class`. These files represent the heart of an RMI service, providing the functionally to define and support the `TimeService` and to link it into the RMI system.

Next, we must build a client applet that will do the following: find the service on the network using the name published by the server, create a link to the service, and use the `TimeService`. We must also build a server-side program to create an instance of the service object and register it under a name that can be found on the network.

A TimeService client applet and server

The `TimeService` client applet allows you to get the local date and time from your machine or to use the `TimeServer` to get the date and time on the server. The code that links the applet to the RMI service is:

```
URL base = getDocumentBase();
String serverName = "//" + base.getHost() + ":" +
            getParameter( "registryPort" ) + "/TimeService"
try { ts = (TimeServer)Naming.lookup( serverName ); }
```

When `ts` is assigned a value, it contains a reference to the remote `TimeService` implementation. Any calls to methods on `ts` will result in a call through the RMI system to the remote computer. To get the server's current date and time, the applet makes the following call:

```
Date sd = ts.getCurrentDate();
```

On the server-side, a program must be written to create an instance of the service and register it on the network. The code that does this is:

```
LocateRegistry.createRegistry( PORT );
ts = new TimeServerImpl();
Naming.rebind( "//" + hostName + ":" +
            registryPort + "/" + "TimeService", ts );
```

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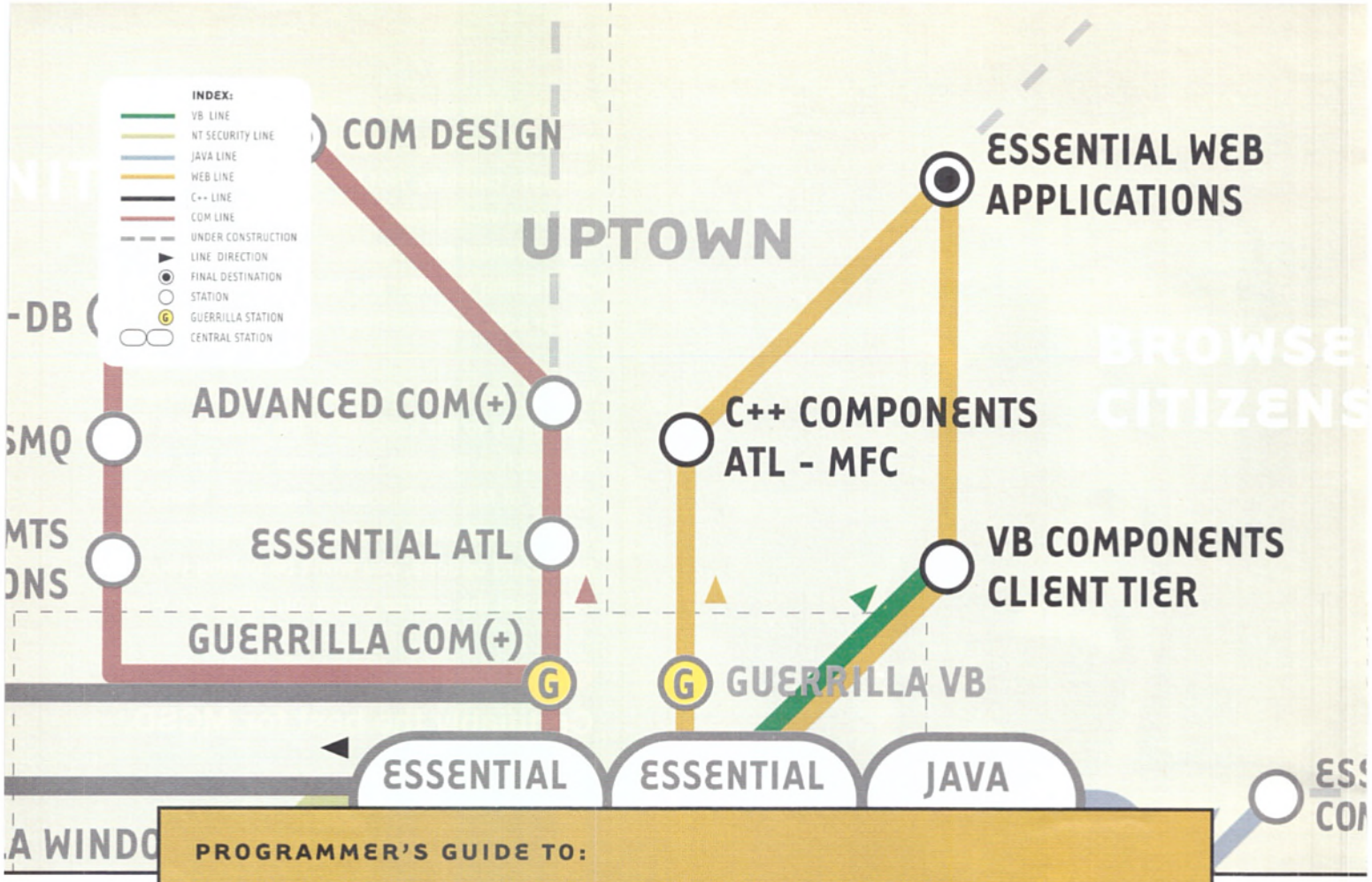

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Forms revisited

Jon Perkins re-examines Forms and how they are handled by the Visual Basic engine, discusses the DLL Base Address setting in the compile dialog, and reviews the VSView 6.0 printing control.

The first action that every new Visual Basic programmer performs is to paint a button control onto the default `Form1`, add a `MsgBox` statement to the `Command1_Click` event, and then run it. From this humble beginning the newbie developer then moves on to understand how to manipulate methods and properties on controls, and gradually learns the core language set. More advanced concepts such as writing ActiveX components eventually follow. It's not unusual, however, for a developer to become so proficient with the basic usage of forms that the true nature of their architecture can be overlooked. To this end, I want to start this month's column by reviewing some information about Forms, one of the most fundamental building blocks of Visual Basic applications.

Forms are objects

Consider the following piece of code:

```
Load Form1
Form1.Show
Unload Form1
```

Once the `Unload` call has been made, does all of the memory used by `Form1` get freed up? The answer is no, which on the face of it is rather surprising. The reason is due to the way that forms are handled by Visual Basic. A form is actually an object that is manipulated behind the scenes by the Visual Basic engine. The best way to deal with a form is to treat it as an object, thus:

```
Dim ofrmDataEntry As FrmDataEntry
Set ofrmDataEntry = New FrmDataEntry

Load ofrmDataEntry
ofrmDataEntry.Show vbModal
' and then...
Unload ofrmDataEntry

Set ofrmDataEntry = Nothing
```

When the `Unload` statement is executed the associated window resource is deleted, but module-level variable data is retained until all references to the form are set to `Nothing`. This is the way that MDI child forms are typically implemented in Visual Basic applications.

The behind the scenes manipulation that I mentioned is that Visual Basic automatically creates a global-scope object variable to cater for forms that are referenced directly by the programmer. For example, if a project contains a form called `Form1` and the programmer makes a call such as:

```
Load Form1
```

then Visual Basic will quietly create a global variable along the lines of:

```
Dim Form1 As Form1
Set Form1 = New Form1
```

so that the `Form1` that the programmer is referencing is actually the object instance rather than the underlying class (which is of course illegal). Getting used to dealing with forms in this manner can lead to a more efficient use of memory. For example, an application that has a large number of forms will consume more memory as each form is called into existence – even when they have been unloaded. Treating the forms as objects and subsequently setting the references to `Nothing` after use will destroy the forms and lead to less wasted memory.

The Form lifecycle

The Form object exposes several important events during its lifetime.

The first of these is the `Initialize` event, which occurs when the new instance of the form object comes into existence. At this stage, module-level declarations are accessible and Subs, Functions, and Properties can be accessed. However, the form itself will not yet be loaded into memory, and consequently neither will any child controls.

Second, the `Load` event occurs when the underlying window that is associated with the form is created. At this time, all child controls are also created. If any preceding code makes a reference to any aspect of the form itself, then the `Load` event will automatically trigger. Any subsequent calls to load a form are then ignored – a `Load` will only occur once before an invocation of the corresponding `Unload` call.

Third, the `Activate` event occurs whenever the form gains focus in relation to other forms within the same application. For example, an MDI application might have a number of child windows open. As the user selects each child window in turn, the `Activate` event for the newly-selected form will fire, as will the `Deactivate` event for the form that has just lost the focus. One possible gotcha here is that a form will not issue a `Deactivate` event if it is being unloaded from a status of having focus.

Fourth, the `Unload` event occurs just before the window is destroyed. It provides the opportunity to save any state data or to update another part of the application. After this event the form object will still be in existence, so it will revert to its post-`Initialize` status. Consequently, all declaration-level data will still be present, but any future reference to the actual form itself will cause a new `Load` event to take place that will initialise the properties of all controls.

This event comes with a parameter called `Cancel`, which allows you to halt the unloading of the form, but this isn't the best place to make this kind of decision. An event that occurs directly before `Unload` is `QueryUnload`, which also provides information as to what originated the call to unload the form. For instance, it might be appropriate to ask the user whether they really want to close a top-level window (and therefore the whole application) if they press the X in the top right-hand corner of the window, but on the other hand if Windows itself is closing then you might not feel that it is appropriate to ask.

Finally, the `Terminate` event is triggered just before the class instance is destroyed. After this happens, all remaining module-level declarations disappear.

If the code has been rebased, a fresh load must take place for each new invocation by another application. This can make the difference between the same component physically being loaded once or five times.

One final point to raise concerning the lifecycle of forms is that calling the `End` command will immediately halt execution, forgoing any `Unload` or `Terminate` calls.

A DLL Base Address

Moving on to a different topic, there is a phenomenon known as synchronicity in which the same event occurs at the same time or in unison. As far as I can recall, at no time had anybody ever asked me to explain what the DLL Base Address option in the compile dialog is for, and then three separate people have asked me this very question during the past few weeks. I know a sign when I'm given one.

In order to understand what the DLL Base Address is for, it is worth briefly reviewing the architecture of a Win32 process. In both Windows NT and Windows 9x an application resides within a *process*, which is defined as a 4 GB address space within which it and any dependent components reside. Although the specifics of this implementation vary for each platform, the basic idea is that the lower 2 GB is specifically used by the application and its resources, while the upper 2 GB is used by the operating system. The main application executable loads first at a point close to the bottom of the 2 GB map, although this initial offset varies depending on the platform. This initial address is generally assigned by the operating system. However, the various components that are called upon by the application – DLLs, OCXs, and so on – can nominate their own preferred location address. If nothing else is occupying that address at the time the component is loaded, then Windows is usually happy to oblige, otherwise the memory location must be altered – an operation known as *rebasing*.

The options dialog that accompanies the Make Project form contains a text box in which you can enter a preferred address. The default value provided by Visual Basic is always `&H11000000`, so unless you change it the likelihood is that every component you produce will have the same load address. If a component doesn't get in at the address that it requested then of course it's not the end of the world, it just gets loaded into a different location. But there are a couple of good reasons why developers take the time to produce a set of components with different load addresses. First, it is to avoid the overhead that is incurred by Windows having to perform the rebasing operation. The other reason is to do with the way that Windows manages its internal memory. Within a Win32 environment there can be a sharing of code pages for in-process components among different processes when the component has been able to load at its base address. However, if the code has been rebased, then this cannot happen and a fresh load must take place for each new invocation by another application. In practical terms, this can make the difference between the same component physically being loaded once or five times.

Base addresses are calculated on 64 KB boundaries, starting at 16 MB (`&H1000000`) and going up to 2 GB (`&H80000000`). This means that there can theoretically be up to 32,512 separate 64 KB addresses available to choose from. Microsoft generally recommends that you choose from any of these possible values at random, and therefore avoid the default base address whenever possible. Owners of the Bruce McKinney book *Hardcore Visual Basic* (2nd Edition, Microsoft Press, ISBN 1572314222) will find on the accompanying CD a utility called *Address-o-matic* that will randomly generate a suitable address.

Corporate development teams might find it worthwhile to maintain a central register of components that have been developed and which are still in use throughout the organisation. Through this database they would be able to keep track of all base addresses currently allocated and could assign new ones accordingly.

VSView in review

I've recently received a review copy of VideoSoft's VSView 6.0, which replaces the Printer object in Visual Basic (see *Suite and easy print control*, News, May 1999). Support for printing has never been particularly rich in Visual Basic although the situation was improved somewhat with the inclusion of the Data Reports engine in the current version.

The VSView product is shipped in the form of three components: vsPrinter, vsDraw, and vsViewPort. The most significant component is vsPrinter, which 'allows you to quickly and easily create documents for printing and previewing'. In essence, this means that you can create a document that includes columns, graphics, headers and footers, and the sort of formatting that is defined by underlying RTF or HTML descriptions. Having defined this document, you can then display multiple-page print previews that include zooming, panning, and thumbnails. This particular component offers a rich set of supporting methods and functions. Accompanying vsPrinter in the package, the vsDraw component provides a means of producing images such as charts, diagrams, and maps, while vsViewPort is concerned with creating scrollable areas within forms, for example to implement forms that are larger than the actual window.

As third-party toolkits go, I must say that I am impressed with the quality of the documentation. A 279-page manual accompanies the CD and provides a full description of all of the properties, methods, and so on.

Another touch that I like is that the first page of each component description includes a list of useful information, such as the component filename, the GUID, the description (as it will appear in the Components dialog in Visual Basic), the icon that will appear in the toolbox, and some general descriptive text. It's clear that a lot of effort was put into this. There are also four separate tutorial chapters, and a fair amount of sample code is scattered throughout the whole book. ■

Jon Perkins is a freelance Visual Basic developer and a Microsoft Certified Solution Developer. He is a contributing author of Advanced Microsoft Visual Basic 6.0 by The Mandelbrot Set, published by Microsoft Press. Contact him at www.jonperkins.com.

My thanks to Contemporary for the review copy of VSView 6.0. It is priced at £199 and is available from most software resellers.

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Perfect career opportunity has arisen within a rapidly expanding, dynamic, telemarketing company. You will involve yourself with the full development lifecycle in Visual Basic and MS Access. Your contribution is of key importance to the business and would suit a developer with 12 months VB experience. You will need to have the ability to lead a team, communicate effectively and be keen to progress in your career. Training to SQL server. *Ref: EK-5366/EX*

SQL SERVER DESIGNER
Reading - Salary Negotiable

Microsoft Certified Solution Provider are offering a fantastic opening to join them as their lead SQL Server Database Designer. You need to have strong Tansact SQL, MTS, DTS and database design. Your involvement with fast paced, leading edge development in a three tier client server environment will enable you to drive the successful team forward. Join professionals working in an informal and extremely flexible environment. *Ref: EK-4986/EX*

VB ANALYST PROGRAMMER
Reading - £30 - £35,000

This opportunity is not for everyone. Are you a high level technical VB developer who would be able to keep pace with the latest technologies at the heart of a leading financial organisation? If so, you have the opportunity to be responsible for the development of new systems, enhancements and full VB/development lifecycle whilst progressing your career within a very high profile company. Unlimited progression and great rewards. *Ref: EK-5222/EX*

APPLICATION PROJECT LEADER
Berkshire - to £40,000

Fantastic opportunity for ambitious, self starter with strong C++/MFC V6.0, Windows CE, Gui design and implementation skills to excel within this high profile position. You will lead the applications team and inject valued contribution to the company's technical development. Your real time/embedded background will be highly appropriate in a cutting-edge environment creating C based mobile communications. *Ref: EK-5188/EX*

VC++ DEVELOPER
Wiltshire - to £30,000

Multi National Company have a vacancy within their computer graphics unit developing software. As a bright, fast learner with at least 12 months VC++ development experience, you will become an important member of this small, friendly and extremely competent team. You will be exposed to cutting edge technology in the print imaging arena. This is an extremely exciting opening. *Ref: EK-5310/EX*

VISUAL BASIC IS AND T SPECIALIST
Berkshire - to £35,000

You will become a key member of the team who provide companies with high level/competitive business intelligence software. As the market leader in this arena, they are only looking for talented, energetic team players who can contribute in breaking new grounds. Your 2 years Visual Basic, Database and SQL development experience coupled with your calm, confident, professional manner will see you as a very suitable candidate. Excellent training and travel opportunities. *Ref: EK-3523/EX*

C++ / VC++ MFC
Berkshire - to £30,000

The broadcast industry is currently offering an exciting opening. You will become part of a front running company based at the European headquarters. Your 12 months + experience in MFC, C++/VC++ will be extended as you work on new development on their unique video systems and complex solutions. You will need to be bright, responsible and very focused. *Ref: EK-3284/EX*

COM BASED VISUAL C++ DEVELOPER
Oxfordshire - to £45,000

Join an expert team within this established company specialising in the success of financial service organisations. Your 2-5 years VC++, COM, DCOM experience will be expanded whilst developing every stage of the project lifecycle. You will become part of a company that are known for their high standards, rewarding career path and excellent training and benefits program. *Ref: EK-4398/EX*

VC++ SOFTWARE ENGINEER
West Berkshire - to £30,000 - £35,000

Join a young, rapidly progressing company working with cutting edge technologies as they develop leading synchronisation software for mobile communication devices. Their business relationships with market leaders in this field, highlight their success. As a forward thinking, ambitious developer with at least 12 months Visual C++, MFC, SDK, Win 32 experience, you will involve yourself with the exciting design and development leading to work based on Internet based PIMS. *Ref: EK-4721/EX*

QA MANAGER
Berkshire - to £50,000

This is a fantastic opportunity to join part of Reuters Holdings. As a young, skilled Quality Assurance Manager with strong development background, you will head and grow the complete QA and Integration function of this leading software organisation. You will have the freedom to work independently in order to be successful in a developing your department from scratch. Your involvement at the early stages of bespoke development, installation and integration is a priority to the company. Their competence within this field will enable the Berkshire site to become the head quarters of QA world-wide. *Ref: EK-5290/EX*

C++ / OO SOFTWARE ENGINEER
Berkshire - Salary negotiable

Superb and unique opening to join part of Reuters Holdings. You will involve yourself with leading-edge technology to develop their clients' most demanding distributed systems. Within a product led environment, you will be keen to further develop your expertise in C++, object orientated techniques and real-time distributed systems as well as wanting to work alongside young and extremely bright individuals. Excellent incentive compensation scheme. *Ref: EK-5287/EX*

IT PROFESSIONAL
Berkshire - Salary Negotiable

As a highly skilled MCP you are in a suitable position to join a prestigious leading International company offering career progression to the highest level. Your skills in ASP, C++ and database design will enable you to forward successfully the development of the internet/intranet and e-commerce applications to internal businesses. Being an effective communicator is an essential quality for any potential applicant. *Ref: EK-5411/EX*

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Cambs - Salary negotiable with benefits

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Contact: Tony Netherclift

GSM SOFTWARE ENGINEERS - C/C++/ ASSEMBLY

Southern UK Up to £50K

We urgently require software engineers of all levels and experience to work on Cellular Communications projects within companies throughout Southern UK. Ideally you should be degree qualified with expertise in areas such as GSM/Cellular Communications Standards, Inter-net Protocols and Embedded Software development. These are opportunities to work with high technologies in a rapidly expanding industry.
Contact: Tony Netherclift

DSP SOFTWARE ENGINEERS

Wiltshire £18,000 - £30,000k

This world leader in Cellular Communications is currently seeking DSP Engineers to work on the development of their Generic DSP Processor. Working in a customer/ technically focussed environment, candidates should be able to demonstrate a development background in C and Assembler, with some knowledge of DSP. Recent graduates will also be considered.
Contact: Tony Netherclift

FIRMWARE ENGINEER

South West £20,000 - 40,000

This forward thinking company are developing UMTS Network Elements for the next generation of Mobile Systems. They now need an Engineer to develop firmware and application software solutions using C, DSP and Assembler. Candidates should be degree qualified and have experience of hardware solutions.
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MULTIMEDIA

Berks to £35k +

Major player in Object Technology, Advanced Web applications, and Multimedia technologies have several vacancies for Software Engineers with at least 2 years experience in some of the following: Delphi (or C++), Visual Basic, GUIs, Java, SQL Server, Active X, Windows 95/NT, Object Technology, Visual C++, MFC, OWL, network management, TCP/IP, embedded systems (set-top-boxes, drivers), Internet technologes.
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Bristol to circa £40k

My client has embarked on a major expansion programme following the start of a new partnership. Excellent opportunity to join this leader and work on new development projects in the areas of graphics or digital video. They have a number of new vacancies in two different divisions ranging from Software Design Engineer to Software Manager and Project Leader. For the graphics vacancies you should have: C, C++, x86, good mathematical skills, knowledge of PC environments and DirectX, 3D, display driver, MPEG, video/graphics standards. For the video positions experience of C, real-time embedded software, set-top box systems, is useful although full training provided.
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C++, Unix, Shell, Perl, Sybase	Analyst Programmer	City	CW
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C++, Unix, Equities, + COM or Java	Analyst Programmer	City	CW
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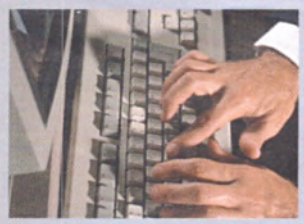

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SAP R3 SD (2 yrs exp)	Implementation	Holland	MP
SAP R3 SD (Senior Level)	Implementation	Holland	MP
ABAP, SD, Billing Systems	Programmer	Holland	MP
SAS, SQL on VMS	Programmer	Cambs	SR
SAP, ABAP	Developer	North	GB

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RPG400, BPCS	Analyst Programmer	North West	JV

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Watch the skies

Sit up and pay attention, crazy white-haired Emmett Brown-wannabes everywhere! CtrlBrk has, exclusively (well, almost), obtained photographs of an actual *flying saucer*. And we don't mean the ceramic kind. This picture was not taken inside Area 51 (that's S4 for all you Robert Lazar buffs out there). It comes instead from the dark recesses of the former Soviet Union, in the little-known Russian city of Saratov – often referred to as the Soviet Area 51, for reasons which should now be rather obvious – and depicts a rather odd-shaped disc-like craft.

Where are the Little Green Men, you may ask? Well, there aren't any. This flying saucer is a purely terrestrial invention. Disappointed? Not half as much as the Russian aerospace engineers at work on the project, which has now been deprived of government funding. These optimistic chappies had intended to create a new type of aircraft which could land and take off vertically, on an ecologically-friendly cushion of air, and fly around at half the speed of sound. Quite a useful vehicle for a country as vast as Russia.

Through the powerful medium of EXE Magazine, we would like to appeal to all software industry millionaires (and billionaires too, Bill) to come up with the cash to save this noble endeavour, not to mention getting the lucrative contract for designing the avionics software. We can think of nothing we'd like to fly in more than a UFO 'Designed for Microsoft Windows CE'.

It's a mad, mad, mad Web

Let's be honest. There aren't many things you can do nowadays that aren't bad for you. Now you can add the Internet to that list. A recent report on psychiatric disorders (*http://www.sma.org/junesmj99/catalano.pdf*) found at least two cases where the sanity-challenged had incorporated the Net into their delusions. One fellow believed that his friends had put video of him and his (probably non-existent) girlfriend up on the Web, and that a friend of his who – he claimed – works for the CIA put 'Internet bugs' in his ears so the CIA could eavesdrop on his thoughts over IP. He also believed that his body had been hyperlinked such that clicking on links on the Web would cause his arms and legs to move spontaneously against his will.

Another was a fruitca... erm, sorry, patient who believed himself to be a witch, and claimed to run a Web site giving advice to other witches. Not in itself an unbelievable story. The patient went on to describe how he could surf the Web using only the power of his mind, however, and how he 'received magnetism' from the Internet three times daily, 'just like on the Dr Pepper bottle'.

Imagine if this phenomenon extended to programming languages; the claims of those who have created 'reliable, mission-critical, totally platform-independent, high-performance systems in Java' might finally be explained.

Programming = dating hell

Another myth exploded. Rumours that all the single men to be seen about town in Silicon Valley are geeks and/or losers have proven to be unfounded. The simple fact is that there are several thousand more single men in the Valley than there are single women. It's just like musical chairs – someone has to lose out.

A census taken recently in Santa Clara showed that the surplus of men to women was 5,400 – which compares against a surplus of women to men of 537,311 in New York, and 127,087 in Los Angeles. Despite their bulging wallets, filled by stock option profits, and generally non-geeky lifestyles, Silicon Valley's unattached men just can't get a date.

That said, software people do not make ideal mates, except for other software developers. A bank manager's wife can ask 'how was your day?' and stand a reasonable chance of understanding the answer – loans and mortgages are things most people can relate to.

A software developer's wife needs to have a working knowledge of (at the very least) C++, Java, Cobol and COM/Corba to make any sense at all out of the response. It can't be any fun waking up in the middle of the night to find your loved one sneakily finishing up a subroutine on his laptop in bed, or trying to vacuum around the piles of listing paper and/or CD-ROMs on the bedroom floor, or tripping all the time on one cable or another, be it Ethernet, power, serial...

Where does he take you for a night out? A smart restaurant? A trendy cocktail bar? Or Burger King? What does he buy you for your birthday? Clothes? Perfume? Or Tomb Raider III? You get the picture.

If you push your dearly beloved too far, you never know where it may lead. Take the case of Kelli Michetti (from Grafton, Ohio, where they obviously don't have the letter Y), as reported in *The Register* (*http://www.theregister.co.uk*). Apparently, Mr Michetti had taken to surfing Internet chat rooms late at night, obviously (she suspected) having cybersex with other women. Figuring that online adultery was just as bad as the real thing, she grabbed a meat cleaver and had at the faithless rogue's poor PC – which was hardly to blame – hacking away at the power cable and monitor. Mrs Michetti might have been less concerned had she realised that most 'women' in these sorts of chat rooms are actually men. On second thoughts, perhaps she might have been more concerned.

Sit up and take note, unattached males! Mend your ways or suffer the consequences. And whatever you do, don't move to Santa Clara, California. Or Grafton, Ohio.

By other means

Little has been made in the mainstream press of the fact that the recent virus ExploreZip, a Delphi program, specifically attacked C++ and assembler sources. Stob wonders if we are on the verge of an internecine techie war.

Day 51. First reprisal by a C++ faction for the ExploreZip assault: the so-called Big Girl's Blouse Worm. As well as spreading itself, the worm attacks systems by seeking out all DLLs and EXEs written in Delphi. Rather than deleting or overwriting these files, the worm appends random bytes to the end, adding a few 100 KB more every time. It simultaneously modifies the EXE headers so that the enlarged file is loaded into memory. Eventually Delphi programs on a BGB-infected machine collapse underneath the weight of the megabytes of gunk they must haul up into RAM at load time.

The strange moniker is explained by a taunting anonymous message posted to one of the newly created anti-Delphi newsgroups. Here is the text:

```
L3T M WRiT3 ViRUZ3Z, L3T M WRiT3 D3ViC3 DRiV3RZ, L3T M
WRiT3 WiNDOW M4N4G3RZ; BUT 4Z LONG 4Z TH3Y UZ3 P4ZC4L,
TH3Y R ZTiLL 4 BUNCH OF BiG GURRRLZ BLOUZ3Z.
D34TH 2 TH3 D3LPHiLTH SCUM! i H8 TH3M 4LL!
TH3 D3LPHiLTH KiLL3R
The opinions expressed in this message are the
author's own, and do not in any way reflect those of
Drommington-Egbarth Small Plastic Containers Inc.
```

A crack team of computer experts from the FBI tries to prolong this thread in an attempt to track down 'The Delphilth Killer'. In the unmoderated newsgroup, however, the Feds are unable to prevent it from turning into a rather pointless discussion about where the apostrophe should go in the phrase *Big Girl's Blouses.*

Day 72. A group of militant Visual Basic programmers decide that they have been ignored for long enough, and produces its own example of the genre. The VisBas virus has several unusual features; the most striking being that it uses a standard installer to propagate itself: *Please wait while InstallShield extracts the files which will install this virus. It is strongly recommended that you exit all Windows programs before running this program. Oh, and if NT users could log on as Administrator, that would be a great help too. Press Down to view the rest of the end-user licence agreement.*

Despite – or perhaps because of – this, the virus is quite successful in spreading. It appears on the cover CD of one of the PC magazines, where it is described as a 'must have Internet connection management and desk diary tool'. Thereafter it is rapidly adopted by all the rival publications, often winning the 'Freeware of the Month' award, until it becomes even more common than that other staple: the out-of-date version of Netscape-Communicator-now-with-annoying-yellow-AOL-Thing.

However, the malevolent action of the virus – to rename `PAS` files to `BAS` 'to show we are just as good' – is so feeble that the anti-virus toolkit companies don't even bother to issue a patch to cope with it, and the VisBas team retires to sulk.

Day 105. However, the Visual Basic effort has not been entirely disregarded, and a Delphi faction retaliates devastatingly. Using a simple virus which, in a brilliant piece of social engineering, spreads by masquerading as unwanted Microsoft promotional email ('Travel to Hong Kong to be among the first to learn about Microsoft's new COM+ mousewheel technology!'), the payload is hideously cruel. It penetrates the huge cluster of life-support DLLs, OCXs, and what not that every Visual Basic program needs to help it breathe and – here's the clever bit – patches one at random *to its own previous version.*

The consequences are appalling. VB programs start dying like flies, often corrupting files and databases as they go, and in extreme cases actually causing machines to catch fire. Since the affected DLL is a genuine VB support DLL, albeit of a slightly older version, the standard anti-virus tools are useless. Finally, Microsoft itself snaps into action, and issues a warning message to its promotional email mailing lists. The impact of the warning is rather muted, as before release it is edited and passed by the Redmond marketing department: 'Microsoft technology triumphs again...'

Ultimately the Delphi virus is successfully countered by a vaccine program, which performs exactly the same version substitution trick – but on the BDE.

Day 127. The first Java virus appears, exploiting a previously unnoticed security hole in the applet sandbox of certain JVMs. Allegedly devastating, it really needs to run on a multi-Gigahertz, multi-processor Sun to be seen at its best. This, combined with the fact that most web users close their browsers on reflex at the dread words 'Loading Java applet', rather limits its impact. But it is jolly well designed, and portable, which is the main thing.

Day 143. The first Linux virus, thought to be created by the very, very extreme 'We love Windows; even Exchange Server' group. The virus spreads itself in packets of data in the archaic NETBIOS protocol and gains control using a fixed-size buffer overwrite. Although it can infect Windows machines, it only actually attacks Intel machines running SAMBA – a package, which allows non-Windows machines to act as Windows file servers. Once installed the virus monitors network traffic looking for likely password strings; every time if finds a candidate, it tries to become root user.

Once a machine has been fully infected, the system appears to go through a standard shutdown. Meanwhile, in the background, the core OS is overwritten. The unfortunate Linux user sees one last message:

```
The system is halting...
System halted.

So you won't be staying up continuously without reboot
for ten years after all, will you, you smug smegger?
```

■

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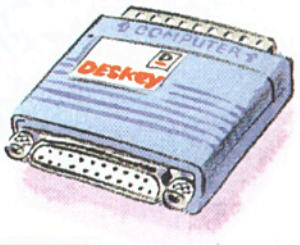

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