THE SOFTWARE DEVELOPERS' MAGAZINE

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MAY 1998

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JDK 1.2
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Perl in
kit form

Visual J++
farewell
cross-platform

Old compilers
never die

The illusion of
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collection

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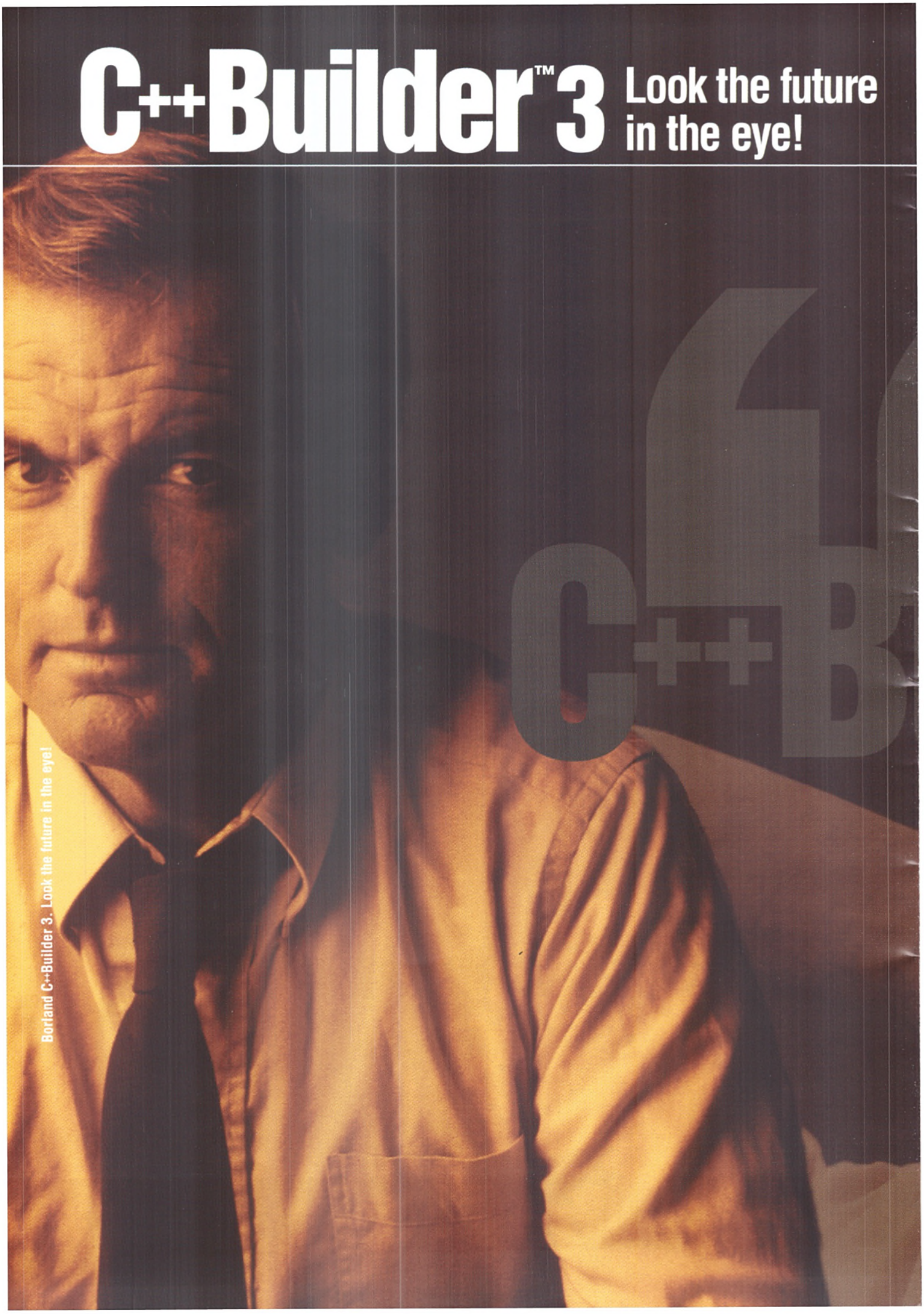
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C++B
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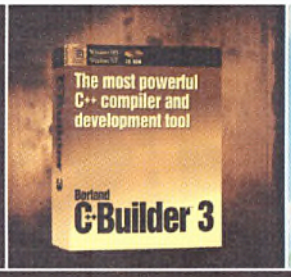

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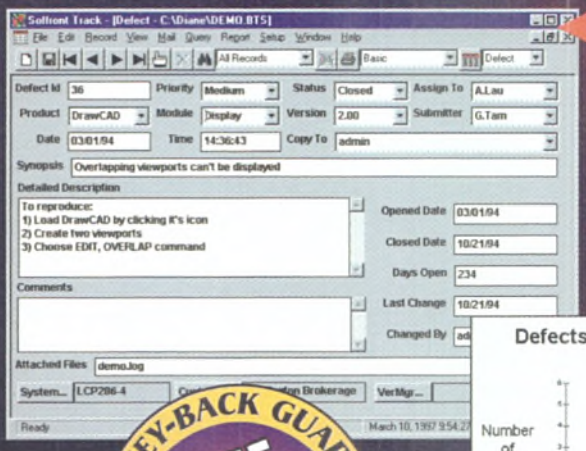

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THE FRONT END

SoapFlakes 7
Out, damn bug. Forget the PC platform.

News 9
JBuilder 2, Palm III, COM2CORBA, and ForeSight software metrics. SCO UnixWare 7, Java testing, and developments on the editor front.

Mayhem 16
Jules has dusted off his old compilers.

Letters 19
Strength in numbers. The world of dongles.

What's left behind? 61

Perl's a plumber 51

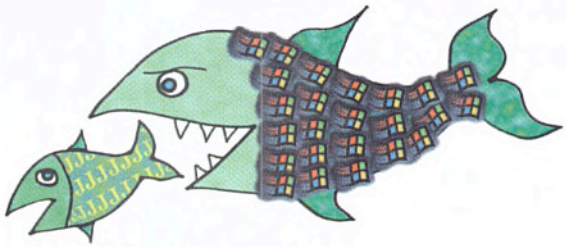
THE CODE

Inheritance considered harmful 22
Inheritance is generally thought to be a good thing. Robert Ennals thinks otherwise. He considers the principles of code reuse and the possible role of aggregation and dynamic typing.

Java applet versus ActiveX 33
There have been many debates about ActiveX versus Java from the point of view of a user, but which is really easier for the programmer? Gavin Smyth introduces the perspective of a developer.

Extend and consume 45
For Microsoft, Java has always been about Windows. Until now, Redmond has always paid at least some lip service to cross-platform Java. But, as Neil Hewitt finds out, Visual J++ 6.0 seems set to change all that.

Methinks ActiveX hath the advantage, my liege. 33



A fish called Java. 45

Perl of a resource kit? 51
Peter Collinson renews his acquaintance with the Perl Resource Kit and shows how it provides a way into the publicly available software in the Comprehensive Perl Archive Network (CPAN).

JDK 1.2 – just in time 57
JDK 1.2 delivers a host of welcome features – JIT compilers, a Java STL, Extensions, and JavaBeans containment services. However, Tom Guinther detects a case of 'version aversion'.

A tip for the garbage collectors 61
Francis Glassborow asks 'Where do you want to work today?' and looks at Java's garbage collection, which leaves memory management to the machine.

Books 65
Mark Harman handles *Software Fault Injection* and Gavin Smyth cracks open *Java in a Nutshell, Deluxe Edition*.

THE BACK END

Subscribers Club 67
Special offers for EXE subscribers. A collection of EXE goodies.

Ctrl-Break 73
As Ctrl-Break considers a European Directive on Software Standards, Verity Stob parle de la bombe de l'an deux mille.

SERVICES

Directory 66
Recruitment 68

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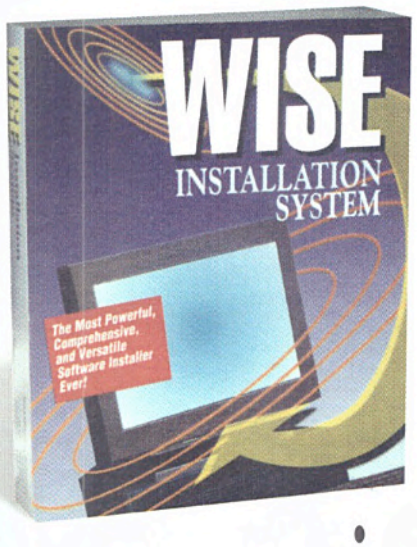

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Out, damn bug

It seems to have become an accepted fact in the software industry today that bugs will always creep into production code, regardless of the precautions and testing and beta programmes that modern applications are invariably put through. Such an attitude makes life easier for developers and software companies, but it certainly doesn't impress the end-user.

I was on the receiving end of a software glitch in the early days of the New Year when I made the mistake of trying to order a so-called 'movie on demand' from my cable company. This much-touted feature is based on Sky's Box Office movies service where the same films are stripped constantly over four channels. The idea is that you order the film you want over an automated telephone line and wait for the next showing.

My local cable company's version of this system involves selecting the required film from a list displayed by the (supposedly) intelligent set-top box, then phoning an automated telephone line and obtaining a pass code which you then type into the set-top box to authorise your purchase. All fine in principle, if a little unwieldy. Of course, this assumes the software that runs the set-top box and the automated telephone booking line actually works.

For a start, the set-top box software was not running at all on the heavily-publicised launch date, so that no-one could actually order a film. This was fixed the next day and replaced with a version which would take your film selection before emitting a plaintive beep and displaying 'temporary error' on the screen. Hardly inspiring stuff. On the third day you could actually get as far as dialling the order line (at least, if you could find a film on the list which the system was prepared to admit was actually available). Unfortunately, as the recorded voice on the phone told me, 'the booking system cannot process your order at this time. Please try again later.' I did: once an hour for five hours.

The next day, success: I managed to get the automated ordering line to take my order – on the third attempt – and typed in the pass number to the set-top box. And indeed it began showing my selected film right on time. In fact, I really enjoyed the film – up until the point ten minutes before the end when the set-top box took it upon itself to turn it off. All this for a whole £1 more than my local video shop charges for a true 'on-demand' VHS copy of the same film.

What, you may well ask, does this have to do with software developers? Well, all these systems have to run on software, which someone at my cable company (or a consultancy of their choosing) has to write. Clearly this person or persons did not bother to test or check their code nearly enough before the launch date. It's not as if they didn't have the time; Sky Box Office launched in November, but my cable company didn't start supplying this service until early January.

So this seems to be another case of the 'bugs always happen' mentality which, as I started out this piece mentioning, seems to be pervasive these days.

I've seen it from the user's side of the fence now, and one thing I can say for sure is that ordinary folk who neither know nor care about memory leaks or pointer arithmetic aren't about to put up with bugs in software which is important to them – like their entertainment systems – for much longer. Perhaps it will not be too long before we start to hear the joke that fifty software developers at the bottom of the sea is a good start.

Neil Hewitt

Forget the PC platform

'In two or three years time there will be 250 to 300 million WAP compatible devices – more than there will be PCs'. I was told this, in March, at the Cebit exhibition by Sanjay Jhawar, European Business Manager – Smart Phone and Data Products at the European Cellular Subscriber Division of Motorola.

Now, how many of you have heard about *WAP?* Raise your hands! And how many know what it is? You can guess from Mr Jhawar's multi-line title that it has something to do with mobile phones, but that's pretty slim. Let me put you in the picture so you can decide whether you should rush to change target platforms.

WAP, or Wireless Application Protocol, is a software architecture which offers a standard platform and communication protocols for developing applications for remote devices such as mobile phones. Its goal is for developers to be able to write applications which will work on all networks worldwide (provided the carrier implemented a gateway) and on all mobile phones. It's based on the UP software developed by Unwired Planet and is now endorsed by most mobile phone manufacturers. Its main use today is for accessing internet-based services from a mobile phone, but the protocols offer much more.

One application, shown on the Oracle stand, consisted in unified messaging. It was developed with the Swedish operator Telia and allows Telia customers to check their email, voicemail, and fax from a web page or from a WAP compatible phone (an Alacatel One-Touch Pocket was used). The demo was impressive and worked flawlessly. According to Oracle's Roland Svensson, the development was easy. It was originally tested with Unwired Planet's WAP-phone simulator and it worked first time with a real phone.

WAP is a series of open protocols controlled by the WAP forum (*www.wapforum.org*). Access to the protocols is free but participation in the forum is not. One important element which remains unclear to me is whether part of the base software infrastructure is proprietary to Unwired Planet or whether anyone can replace parts of it. This might have an impact on its success compared to all the internet protocols, even though these are not currently targeted at small devices.

Whether Jhawar's prediction is accurate or over-optimistic, WAP is definitely worth a look if nothing more.

David Mery

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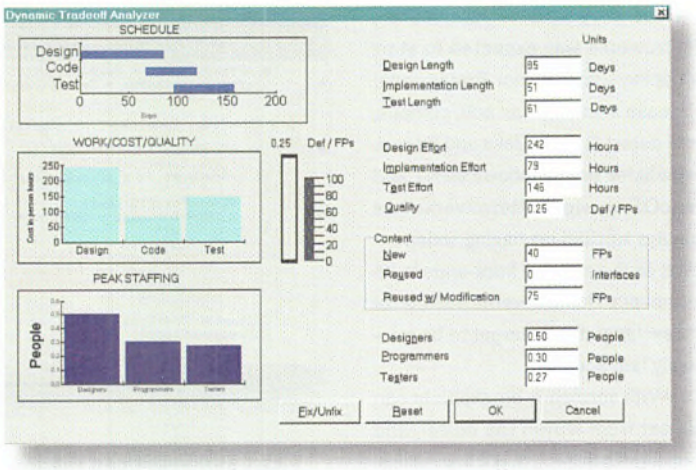
Centre stage without emotion

We have all heard disastrous statistics regarding software development: 30% cancelled, 70% failing to meet expectations, an average of 189% over budget (the Standish report). Foresight 1.01, released in the UK by PRICE Systems, is designed to address the issues of software forecasting and estimation. With its GUI, use of wizards, and integration with Microsoft Project it is intended to be central to the life of software projects.

Aimed at anyone responsible for producing any forecasts or estimations, it enables the scope of a software project to be estimated accurately in terms of time, scale, cost, and manpower. Users are able either to establish parameters based upon their own specific software development methodology or to adopt one of Foresight's pre-set standards for guidance. Explicit values can be entered for all the parameters used for its parametric estimation model (development conditions, staff quality and familiarity, availability of CASE tools, etc).

A 'questions and answers' approach to the initial estimate creation involves project scope, available resources, required timescale, and overall objectives. The estimate is then refined within ForeSight's Process Profiler by being broken down and analysed section by section. For example, Function Points, Lines of Code, and Predictive Object Points (POPs) can be used to estimate the overall size of the project. POPs are a sizing metric developed by PRICE Systems to support object-oriented design, accounting for class structures methods, inheritance, and interfaces.



The DynamicTrade-off Analyser (pictured) enables users to perform 'trade-offs' with various features of the project. The user can ask 'What happens to the estimate if I cut two months from the project timetable?' The DTA will immediately chart how the project's estimated cost, resources, and quality should change.

For use with Microsoft Project, data can be easily swapped iteratively (via OLE), tracking major milestones, estimated time to completion, and benchmarking major technical accomplishments.

For Windows 95 or NT, ForeSight 1.01 costs £740 per single runtime.

w www.PRICESystems.com

Bridging COM2CORBA

A bridge between applications using Microsoft's COM and Corba components is provided by ICL's DAIS COM2CORBA. The software will enable developers to link COM applications to other systems in an enterprise, such as Unix and OpenVME, through a Corba interface. An extensive knowledge of IDL (Interface Definition Language) is not required.

DAIS COM2CORBA makes use of COM to allow Microsoft automation clients to connect to DAIS Corba components anywhere on the network as if they were local components. DAIS servers are implemented as COM controls directly within the Windows application.

Automation method calls are transparently passed to an appropriate Corba server for execution and the return of results. If the Internet Inter-ORB Protocol (IIOP) is used, these servers can be implemented using any ORB product which supports IIOP, not just DAIS.

The COM2CORBA SDK is priced at £1995. Deployment of COM components created with the kit will be free of licence charges, provided the application interoperates with licensed DAIS components.

In a separate announcement, ICL has offered DAIS J^2, a Java version of the DAIS ORB, to developers at no charge. It can be downloaded from the ICL website.

w www.daisorb.com

UnixWare 7

SCO has announced the availability of UnixWare 7, a Unix system for Intel servers. It integrates the two Unix systems SCO OpenServer Release 5 and SCO UnixWare 2.

UnixWare 7 supports 1 terabyte files/filesystems and 64 GB of main memory. Its memory model, compilers, and commands have been designed in preparation for 64-bit Intel systems next year. There is a 'web top' interface.

A new Unix development system, UDK, will enable the creation of a single binary to run on the three main SCO server platforms. The UDK features C and C++ compilation systems, a new graphical debugger, performance profiling and optimisation tools, APIs, and tools for TCP/IP, networking, and graphics.

w www.sco.com

NuMega DevPartner for Java is a suite of development tools which automatically detect, **diagnose**, and help to resolve **Java** performance problems and runtime errors. It consists of TrueTime Java Edition and NuMega JCheck.
www.numega.com

Cantata++ is designed to assist developers in the unit and integration testing of C++ software. The verification tool, from **IPL**, provides both dynamic testing and **coverage** analysis facilities. It supports the latest ISO language features and OO coverage metrics.
www.iplbath.com

OpenTalk SDK allows users to design or amend a range of **telephony** applications, from simple call routing through to complex interactive voice response applications. The NT based SDK is from Kingston Voiceware.
01482 808200

Vireo's **Driver::Agent** is a toolkit which enables applications to directly access and control **hardware** on all Windows platforms without performance penalties. Eliminating the need for Microsoft's **DDK**, advanced programming features include built-in Timers, Shared Events, and the ability to construct custom Kernel Agents.
www.vireo.com

Two configurations of CYRANO's web-based application **testing** software are available. WebTester validates the quality of web-based applications before deployment and after changes. **WebTester** Business Edition provides an additional monitoring capability.
www.cyrano.com

The full werks – languages & compilers

ADABAS D 10 is a new version of the Software AG RDBMS for Unix and Windows NT. It has a new **JDBC** interface which provides **SQL** support from Java programs and direct access from browsers. The system may be managed remotely via a new GUI.
www.softwareag.com

Cayenne Software's OO analysis and design products, **ObjectTeam** and ClassDesigner, support **Visual J++ 6.0**, the latest release of Microsoft's Java development environment. These tools allow programmers to generate VJ++ code from, and reverse engineer into, object models.
www.cayennesoft.com

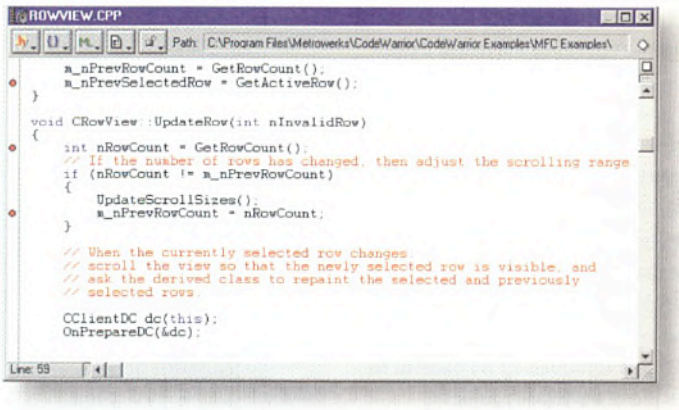
The **Year 2000 Detective**, from Windsor Software, is a tool to help developers analyse desktop applications to identify quickly and document **Y2K** code changes. It works for applications written in **Visual Basic**, Access, C/C++, and Delphi.
www.windsorsoftware.com

Sterling has enhanced **VISION:Solutions 2000**, a suite of Y2K tools and consulting services. The tool set includes VISION:Simulate, a date simulation tool which allows the system date to be moved beyond 1/1/2000, and CVISION:Dager, a **data ageing** utility and windowing.
www.sterling.com

The **Open Group** has made publicly available its Network Computer Rendition **Test Suite**. The suite can be used to evaluate conformance of systems to the Open Group's standards. It includes tests for requirements for **Java 1.1** class libraries and W3C's HTML3.2 specification.
www.opennc.org

At the very end of last month, Metrowerks was expected to start shipping CodeWarrior Professional Release 3. Its IDE can edit, compile, and debug C, C++, Java and Pascal. It includes both Windows 95/NT and MacOS versions. Metrowerks has always worked on having independent back-ends and front-ends to its compilers. This allows the addition of a new language or target to be relatively fast and easy.

With version 3, breakpoints can be set from within the editor, and both AMD-3D and MMX instruction sets are supported from inline-assembly. Part of the package is a new – pre-release – native Java compiler for x86 and PowerPC targets (based on the JDK 1.2). A JavaDoc postlinker generates HTML documentation directly from the information generated during the compiler's parsing phase. The seamless integration of the IDE and the debugger reduced the memory footprint by not requiring the use of two separate applications.



Metrowerks shipped the last version, Release 4, of its CodeWarrior Tools for 3Com PalmPilot last January. Following its quarterly release schedule, a new version supporting the OS3 – present in the Palm III – is planned for July.

As for BeOS support, v1.5 is the first version of CodeWarrior to run on a Pentium-based computer. The agreement between Be and Metrowerks has been extended to put the strategic direction of the IDE for BeOS in the hands of Be, while the compiler and linker remain the responsibility of Metrowerks. Sales and marketing will be done by Be, so developers can get BeOS and CodeWarrior in one go. At the time of writing BeOS Release 3 is available only on Intel. When it becomes available on the PowerPC as well, the final version of CodeWarrior will ship.

CodeWarrior Professional 3 costs £335.

w www.metrowerks.com
w www.fullmoon.com w www.be.com

Active Toolbars

ActiveToolBars is a 32-bit, framework-based component, enabling developers to build Office '97-style toolbars and menus into their applications. The latest ActiveX release from Sheridan has a WYSIWYG design-time editor, allowing the toolbars and menus to be viewed in design-time as they will appear in runtime. They can be configured to allow end-users the full runtime customisation found in the Office '97 products, using what should be the familiar customise interface.

A configuration utility simplifies the creation of the toolbars and the tools they contain. It includes an image editor, a screen capture utility, and the design-time preview window.

ComponentSource is selling ActiveToolBars at £85. It can be downloaded from their web site, which is now fully commercial – all the software components and tools can be directly downloaded.

w www.componentsource.com

OLE DB – SQL for your email

INTERSOLV, the provider of ODBC technology, has turned its attention to OLE DB. A Microsoft specification, it is designed to provide a low-level standard for accessing all types of data, regardless of type, format, or location (there is a single API for operating against both SQL and non-SQL data sources).

DataDirect Connect OLE DB is a set of components (OLE DB data providers) which enable applications to have new access to non-relational data. Using ADO, Connect OLE DB data providers are immediately usable by all ADO-enabled applications, including Microsoft's VB, VC++, and VJ++. This provides access to data such as Lotus Notes Mail and MAPI-based email data.

Connect OLE DB is designed to enable organisations to customise data access through reusable and shareable data access components. For example, if direct access to Lotus Notes data is required then the Connect OLE DB data provider for Lotus Notes can be used. For extra functionality, organisations can also implement DataDirect Reflector, a query processor engine (QPE) for OLE DB, enabling traditional SQL processing of the Lotus Notes data.

An important component of the DataDirect Connect OLE DB family is the ODBC/OLE DB Adapter. This transparently migrates ODBC technology to OLE DB by connecting ODBC-based applications to OLE DB data and service providers.

A Connect OLE DB data provider, or the Connect ODBC/OLE DB Adapter, is available at the introductory price of $99. The DataDirect Reflector is also $99.

w www.intersolv.com

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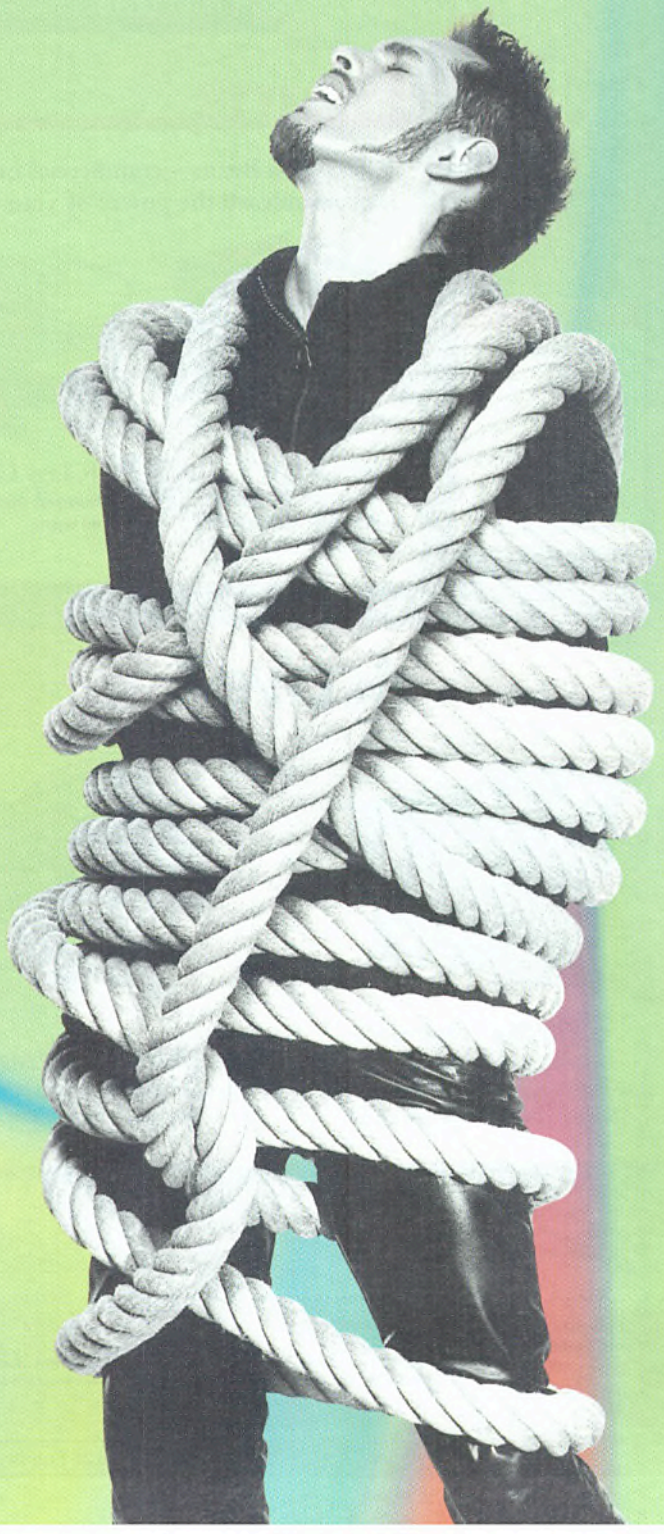

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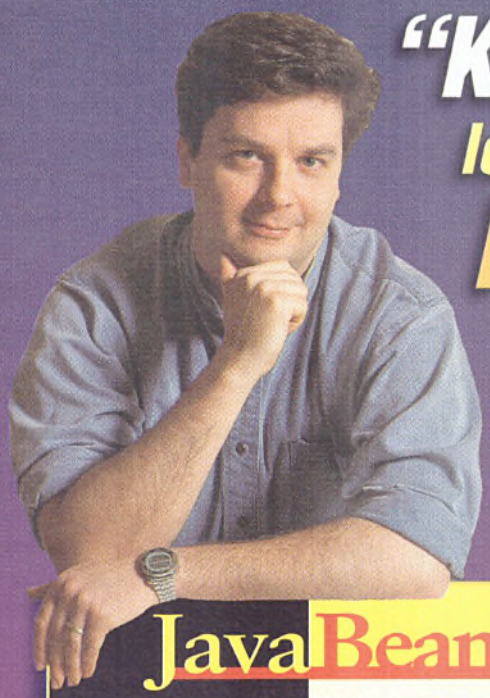

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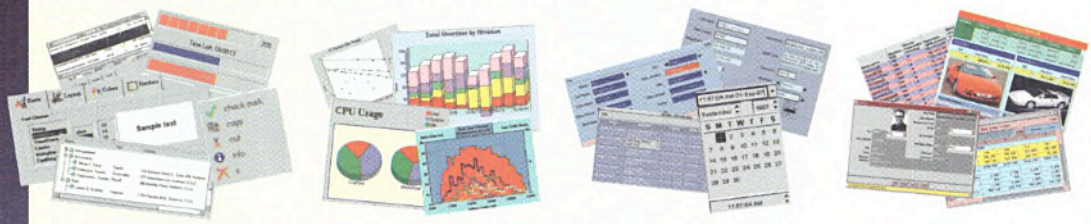

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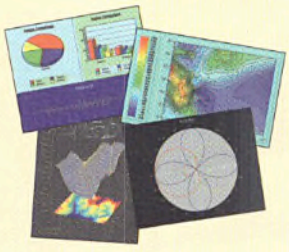
ActiveX



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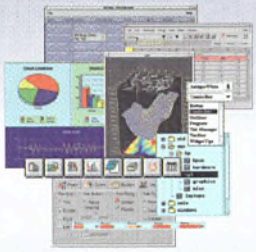

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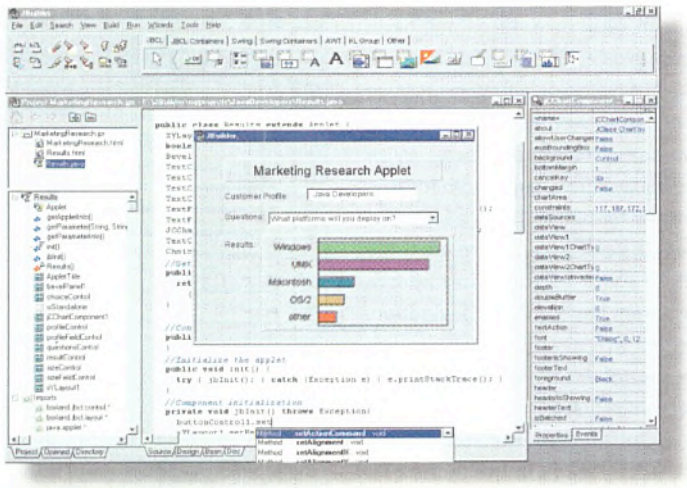
A declared state of platform-independence

Borland's major product release this quarter is JBuilder 2, the family of visual development tools for building platform-independent applications with Java. It will be available in three versions Standard, Professional, and Client/Server Suite.

The JBuilder product family features easy JavaBeans component creation, a scalable database architecture, 'two-way' visual development tools, and the production of '100% Pure Java' applications, applets, servlets, and JavaBeans. The JBuilder environment supports JDK 1.1x, JDK 1.2, JFC/Swing components, JavaBeans, Enterprise JavaBeans, Corba, RMI, and JDBC.

JDK switching allows developers to compile and run their applications against any JDK virtual machine, from JDK 1.02 onwards. Another feature, JFC/Swing component integration, is to promote the creation of more professional looking 100% Pure Java user interfaces, and JBuilder 2 includes a set of enhanced JFC components which are fully JDBC data-aware.



A useful aid for learning the Java language, CodeInsight is a set of wizards for the fast development of robust applications – it provides the proper syntax when creating and editing code parameters, variables, properties, methods, and events.

For enterprise scale development, JBuilder 2 features integration with a new version of the VisiBroker (3.2) ORB.

In the realm of beans, the BeanDesigners enable developers to visually display, add, and edit JavaBeans properties, events, and methods. An analysis tool is provided in the form of BeanInsight, which provides information on valid properties, property editors, and customisers.

JBuilder Standard has an estimated street price of £84, JBuilder 2 Professional £499, and JBuilder 2 Client/Server Suite £1399.

w www.borland.com/jbuilder/

Palm III: more for the developer than the end-user?

The Palm III – successor to the PalmPilot – hit the street last month. The most visible improvements concern the hardware. Although the included applications look more or less the same (with the addition of an IR beam function, and support for different fonts), many more improvements have been added from a developer's point of view. For example, all storage heaps have been collapsed into a single large one, which takes all the memory available, except for the dynamic heap which is larger (96 KB). This should reduce dramatically the memory fragmentation which happened with previous versions of the OS. Still on the subject of memory, some file streaming APIs allow the manipulation of blocks larger than 64 KB.

On the UI side, the new fonts mentioned above are accessible by all applications. Some APIs have been added to create form elements dynamically at runtime. One of the most important novelties is the infrared capability, compliant with IrDA. The IrComm layer of the stack is not present in the first release though it should be made available in a couple of months. A demonstration of an infrared communication between a Palm III and an Ericsson SH888 GSM phone was shown at Cebit. Smartcode Software had developed the IrComm module used. HotSync is not supported over IR. According to 3Com this is not due to the current lack of IrComm but to all the differences in IR on laptops. It is planned though.

Upgrades to the OS will consist of a simple download, and won't take any precious RAM space as the OS is in Flash memory. This raises the questions as to whether developers will be able to offer the capability of moving their applications in the Flash, possibly replacing part or all of the OS. This would allow you, for instance, to replace the calculator by one with hexadecimal support, or in a more extreme way it would let the uClinux project team replace PalmOS by Linux! (See *Ctrl-Break* EXE, April 1997.) Some rumours of a Flash SDK are circulating but so far 3Com refuses to comment.

Support for the MacOS as a development platform will be improved to match what's available on Windows. 3Com is working to improve the support on Unix but nothing has been announced yet.

A debug version of the PalmOS and a new version of the CoPilot should be available on the 3Com web site by the time your read this.

A developers' conference will be organised in Santa Clara from December 2nd to 4th. For more info on all the new features, check out the 3Com web site.

w www.palm.com/devzone/

Netron Renovator 2.0 is a 32-bit version of Netron's 're-architecting' tool for mining legacy systems and creating reusable components. The new version extends the code analysis capabilities of Micro Focus' **Revolve**, the tool set upon which it is built.
www.netron.com

Progress Software has licensed the Java Application Environment (JAE) and Java Development Kit version 1.1 (**JDK 1.1**) from Sun. Under the agreement, Progress will integrate the **JAE** and JDK 1.1 into **Apptivity 2.0**, the tool for building and deploying cross-platform database applications in Java.
www.progress.com

jCentral, an Internet **search engine** for Java developers, is a feature of IBM's Java website. Its predefined search parameters and Java-specific indexing is designed to let developers exactly locate **Java** resources. Search categories include applets, JavaBeans, source code, and newsgroup articles.
www.ibm.com/java/

Delphi/Connect for SAP makes it easier for developers to build customised applications which integrate fully with **SAP R/3**, without requiring knowledge of the SAP architecture or BAPIs. The Windows development environment from Borland, is based on **Delphi** itself.
www.borland.co.uk/SAP/

Fully supporting the latest **Fortran 95** standard, the **NAGWare f95** compiler provides software developers and programmers with enhancements over the previous Fortran 90 compiler.
www.nag.co.uk

Careful with that editor, Eugene

ComponentWorks Version 2.0, from **National Instruments**, is a 32-bit ActiveX control suite for test, **measurement**, and automation applications. Version 2.0 adds controls for serial I/O and for exchanging information over the Internet.
www.natinst.com/uk/

The newly released Netscape **Navigator** web browser source code has been ported to Qt, **Troll Tech**'s multi-platform GUI toolkit. A **QtScape** demonstration programme has been released to promote the effectiveness of the toolkit. Full source code is released under the Netscape Public Licence.
www.troll.no/qtscape/

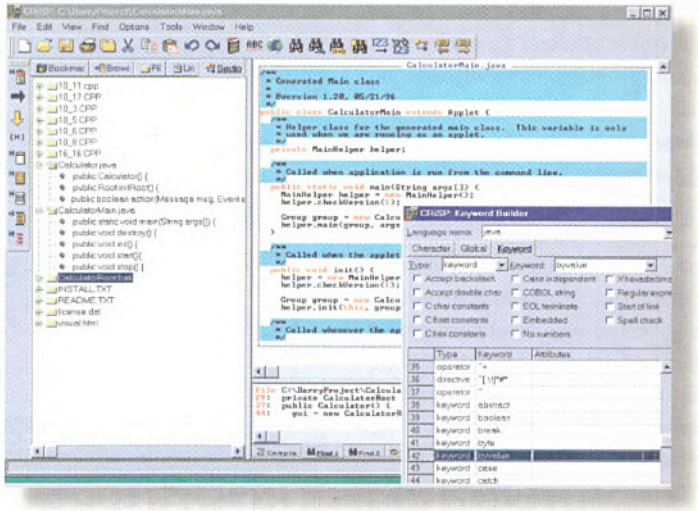
Automatic documentation of **C** code is provided by the Hitex **Development Assistant** CASE tool. It automatically generates flow diagrams and a display of the calling hierarchy within the program. It links to the Hitex range of **emulators** to allow debugging of code on a target system.
www.hitex.demon.co.uk

Clarion 4 Internet Edition consists of Clarion 4 Professional Edition and the Clarion Internet Developer's kit. It can be used to **web-enable** existing Clarion applications, using a one-step template-driven process. It results in **database** applications which can run from inside any Java-based browser.
www.contemporary.co.uk

RealCT Release 2 is an API designed to shield developers from the complexities of **Computer Telephony** resource switching. The Windows DLL, from **Lucent Technologies**, has enhanced tracing capabilities for error detection and GSM support.
www.lucentctproducts.com

A raft of new features has been added to CRiSP, the editor for software developers which provides a common editing environment across different platforms. With more functions and toolbars it is easier to customise the look and feel of Version 6.0. There are three main extra features to improve program legibility and navigation, which are aimed particularly at groups of developers working on a shared project.

'Outlining' of documents can be performed via the icons of a vertical toolbar, to hide or reveal portions of a program. For example, C/C++/Java comments can be 'folded' away by clicking the comment button. The View menu gives access to two new windows, 'Contents' and 'Output'. The table-of-contents style window within the edit area displays bookmarks, links, or sections (routines or file sub-sections) in a tree-view, to allow quick navigation and at-a-glance summaries of the state of the editing environment. The Output window at the bottom of the screen provides an easy method for viewing



feedback from compilers and search requests.

New file-merge support means that files can not only be compared for differences but automatically merged, allowing the user to edit the merged file to decide which changes to keep. Improvements have also been made to the performance of editing huge (100 MB+) files.

The Find/Build tags menu option now provides a quick way to call up the CRiSP tags (crtags) utility. Extensions to crtags include the ability to automatically scan a directory tree for source files (to help keep a tags database up to date). The source code browser is built on the tagging facility. It provides a hierarchical way to see the objects defined in a set of source files, eg C/C++ classes, enumerations, or functions. CRiSP also provides support for Java, Ada, Verilog, and VHDL.

Priced from £75 for Linux through £150 for Windows 95 and NT to £350 for a floating license on Unix workstations.
w www.pacemaker.co.uk

Test anywhere

Java support has been added to Mercury Interactive's range of testing tools: WinRunner and XRunner for functional testing of Java clients, LoadRunner for load testing of Java-based systems, and TestDirector for test management and quality control. The major Java toolkits are supported, including Sun's AWT, Oracle's Developer/2000, and Sun's JFC, with upcoming support for Microsoft's WFC.

Test scripts can be rerun across the different Java platforms, to provide a comprehensive testing of Java implementations. Test script development can be shared across different browsers and platforms, shared between Java and traditional clients, and be used for load testing.
w www.merc-int.com

Unix port in an NT storm

Win32 API support together with DCOM and ActiveX standards are made available to developers porting to Unix, with Mainsoft's MainWin XDE 3.0. The toolkit was apparently used by Microsoft when porting IE 4.0 to Unix.

With regards to the Win32 API, MainWin XDE has support for the Windows NT 4.0 look and feel, NT 4.0 memory management, Shell32 library, Win32 Structured Exception Handling, and Asynchronous Procedure Call APIs.

In the realm of DCOM, MainWin XDE supports multithreaded apartments and the marshalling of data between threads, allowing for use of the symmetric multiprocessing capabilities of Unix desktop platforms. MainWin XDE enables cross-thread communication as well as the intra-process, cross-process, and remote access to objects through the RPC Subsystem (RPCSS).

With MainWin XDE the header files and shared library (ATL.DLL) needed for ActiveX Template Library 2.1 are fully supported on target Unix platforms, which enables developers to take advantage of ATL while developing in Visual C++.

MainWin XDE 3.0 is available from OpenGate on the Solaris 2.5.1 platform. Other platforms – SGI IRIX 6.2, HP-UX 10.20, IBM AIX 4.1.5, and Digital Unix 4.0 – will be supported by mid 1998.
w www.opengate.co.uk

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A window on the past

Jules has dusted off his old compilers.

I wrote a program the other day. It wasn't a very big program; it was just a little something I knocked up to help debug a piece of hardware I was making. Because this was going to be used by other people I wanted to do a nice job of it – make it look professional – so I gave it lots of little animations and online help, and generally jazzed it up until it became a joy to use. Nothing remarkable in that, you might think, and you'd be right. What was unusual was that I did it in DOS using a ten-year-old compiler – Turbo Pascal 4.

There were several reasons why I chose to use TP. First, it was the quickest way to get the job done. Had I attempted the same thing in modern languages, I'd have needed a month with C++ or half that in C with VB, instead of the day and a half it actually took. Second, a live keyboard was the easiest way to control the program – mousing around the screen wouldn't have given me both the immediate control and the pre-prepared submissions in one interface (and I did need both). Finally, it gave me a tiny memory footprint – a few KB instead of a couple of MB – which in a diagnostic tool is something devoutly to be wished for.

Note that I'm not saying I couldn't have written the program with a modern, Windows-aware toolkit; I could, but it would have taken longer, and not have worked so well.

After a day and a half (including planning) the program was finished, and I was struck by how easy it was (even though I'd mistyped every :=). All I had to do was think about the problem, and there was the solution sitting in front of me.

After ten years of writing major stuff in Windows, it took 500 lines of Pascal to remind me what it was that drew me into programming in the first place. Pascal is good that way. Provided you approach it top-down and name everything (the way it expects of you) Pascal delivers good, reliable, maintainable code almost without trying. Turbo Pascal was exceptional because it contained extensions which had obviously been designed by real, working programmers. Hardware access was simple, interrupts were trivial, and there was an elegant constant definition mechanism which was even better than C's. This was a language in which a rookie programmer could develop civilised skills and still learn from reading the examples of his elders and betters.

Modern tools aren't like that – we hardly ever hear of top-down programming now. We start with the dialogs instead of the problem – outside-in I guess you'd call it. A learner of today probably starts with Visual Basic, and has to proceed without the benefit of records, named types, or enumerators. The only structure he gets is that imposed by the forms, and type checking is systematically undermined by those silly variants. What kind of a way is that to learn programming? (C++? Who said that? How can you teach programming with C++ when most ten-year veterans don't understand it?)

In fairness, both VB and MFC show how a Windows program should be. Windows is document-centred – and uses a model in which the document is entirely passive, and the forms which act upon it are almost entirely static. That was another reason my program wouldn't work in Windows. There was no document at all, and the 'form' was actually highly dynamic – changing both its data and its shape, not just in response to the user but to the innards of the computer as well. It was, in fact, the very model of how an intelligent assistant should behave, and an indication of why a manager values his PA more than his notepad.

Though it has some validity, the Windows model is not universal – you can tell that when you see how expert systems, CAD, and even the compilers themselves are shoehorned into what would otherwise be a completely inappropriate model. But because they're chasing the Windows model, modern programming tools are inimical to any other model, and that strikes me as dangerous because the programmers of tomorrow are not getting to see anything other than documents.

We should consider, too, the question of program size. My TP program was relying on the operating system to get it started, and for some simple timers, and that's it. In 25 KB it enclosed its entire functionality. Ten years ago, that was a midrange program. Today, a midrange program has 1 MB or more of executable. Some of that bloat can be explained by the fact that a modern program has to exert more control over its environment, but that doesn't explain it all. No, most of that bloat comes from enormous class libraries which are linked into the executable to provide facilities which we all think are actually part of the operating system – things like loading, linking, toolbars and their associated ToolTips, ini and registry interrogation, and OLE. It's ironic to think that, as each generation of Windows claims more facilities, those facilities are actually bound right into the programs and are, in reality, functions of the class libraries used to build the programs (which, if truth be told, Microsoft has also supplied). It's no wonder that Windows has a reputation for being flaky – at least when a compiler and all its libraries and help files and config fitted on one floppy, it had some chance of being right. A compiler which doesn't fit on a CD hasn't a prayer.

Windows is really just a task switcher and screen driver, and everything else is being done by software writers for no better reason than Microsoft is telling us to (even loading is done by DOS – or the program itself). For the life of me, I can't work out why there's no GNU Windows.

Alongside the TP4 manual, I have a 1988 copy of Petzold's *Programming Windows*. At the end of chapter 1, he makes the case that Windows is harder to learn but it's easier in the long run because you don't have to write your own UI code – instead you get a stack of facilities for free. Somewhere along the way, we've all lost sight of that because in this example (and in many others) it simply isn't true. And I'm not sure that it ever was. I, at least, am lucky because I still have my ancient compilers, but I suspect few of us do, and beginners can't get them at all. ■

Jules is still a programmer. He misses the old days when it was possible to write a meaningful program in less than 50 man years. He can be contacted on 01707 662698, or as jules@cix.co.uk.

2
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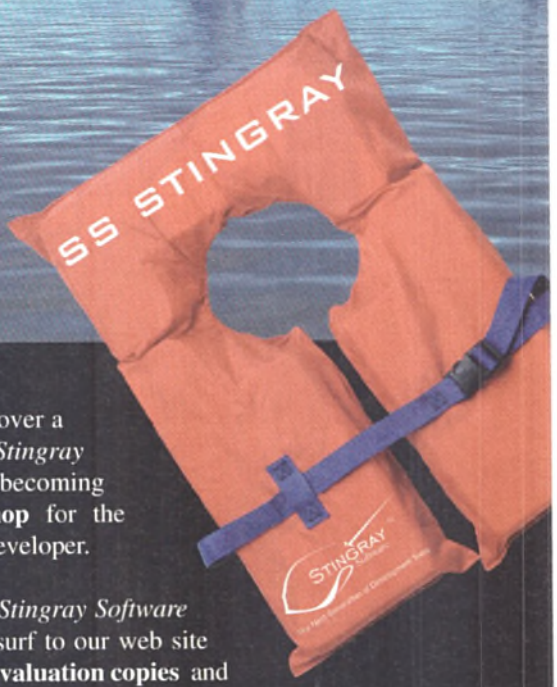

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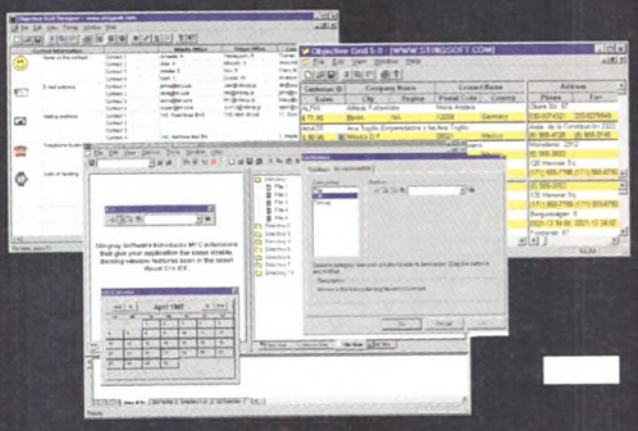

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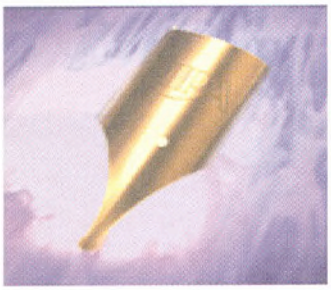

We welcome short letters on any subject relevant to software development. Please write to: The Editor, *EXE Magazine*, St. Giles House, 50 Poland Street, London W1V 4AX, or email editorial@dotexe.demon.co.uk

The world of dongles

Let's talk about the real world of dongles, not the make-believe one discussed in last month's *Mayhem* column. This crude attempt at market analysis won't be sending shockwaves of job insecurity around genuine hi-tech analysts. It ignored the real world of software developers, software users, hackers and industrialised software piracy. Its claim that 'fewer and fewer commercial programs are using dongle protection' is simply untrue. It was an incoherent attack on the only effective defence we have against a multi-billion dollar crime that costs jobs and corporate revenue, that raises the costs of products, straitjackets R&D budgets and even damages national economies.

So let's talk real facts.

Autodesk, the world's fifth largest software house in a recent discussion document published on their web site admitted that piracy cost them 50% of their revenues. We all know AutoCad is expensive. Guess why!

Praise them for their honesty.

In the UK, the illegal use of software cost the software industry £220 million in 1996 with 34% of software being used illegally.

Price Waterhouse's 1997 study revealed in stark detail the cost to national economies of software piracy. A 15% cut in the piracy rates between the years 1996 and 2000 in Latin America would create 275,000 jobs and generate $4.86 billion of tax revenues.

Never argue with your accountant!

So this is the real world we ignore at our peril.

More ignorance is shown when it's stated that 'a routine which has been provided by the dongle manufacturer ... an amateur hacker can bypass in ten seconds flat'. This is nonsense. Properly implemented protection cannot be cracked by an amateur, and even professionals don't find it easy.

But let's talk a real case. One of Aladdin's products was recently selected to protect a software program for implementation by Interpol. As part of the appraisal process, Holland's top hacker (did they find him in Yellow pages?) was given a 30 day challenge and a $5000 bonus to crack the key. He gave up after three and a half weeks.

And just for the record, the process of protecting a program does not require any knowledge of cryptography. It can take a programmer as little as ten minutes work using a state-of-the-art GUI and Wizard. And as far as the end-user is concerned, he's got a normal program doing just what was required of it – smoothly, transparently and with the reliably he expects and demands.

And using dongles isn't a one-sided affair. Even the end-user benefits in the form of network license management, data encryption, and the knowledge that one isn't committing the crime of software piracy.

And now, with the Universal Serial Bus now standard on all new PCs and laptops, and with new peripherals increasingly sporting USB ports, it's no surprise to find Aladdin introducing USBHasp and Hardlock-USB, the industry's first USB-based protection device. Aside from offering fully-featured protection, its ease-of-use and hot-pluggability offer the end-user the ability to disable his program and protect data by simply removing the key.

So let's cut through the myths and focus back on realities.

More and more developers are protecting, and they are not losing sales. They are selling more legitimate products, increasing their revenues, putting more into R&D, offering better deals, cheaper upgrades, better service. We at Aladdin know this from the regular contact we enjoy with our developer customers in the UK and throughout the world.

And the reason why!

That damned dongle!!

Ray Lewis.
MD of Aladdin UK

The April Mayhem has generated some strong reactions from dongle manufacturers, two of them pretty negative (including this very letter from Aladdin) and one very enthusiastic. Few articles generate so much reaction from manufacturers/ publishers. How do *you* feel about dongles? Do take the time to put finger to keyboard and email us your comments. – Ed.

Strength in numbers

Dear Sir,

I feel very strongly that we have the right to privacy with no interference from *any* government.

To this end I have been conducting a campaign against the US initiative by publishing a 128-bit key encryption routine on my Web site *(www.brittena.demon.co.uk)*. The control is an ATL control (ActiveX lite) so is suitable for Web deployment.

I have previously treated this as a shareware initiative. The free version of the control uses a modified version of an encryption algorithm that has one known successful attack. I believe the modification makes that attack impracticable but that is untested. The registered version uses an algorithm with no known attacks. I have also offered the source code – at a fee. The source code is available in C++ and VB. I am currently coding a Delphi VCL / Pascal variant.

If there is sufficient support from you and your readers I could make the code freely available so that everyone can routinely use it. If everyone flouts this silly (proposed) law, it becomes unenforceable.

I believe after the German invasion of Denmark the entire country took to wearing a yellow star to thwart persecution. First they came for the Jews....

Let us take positive action to preserve our privacy.

Anton Britten
anton@brittena.demon.co.uk

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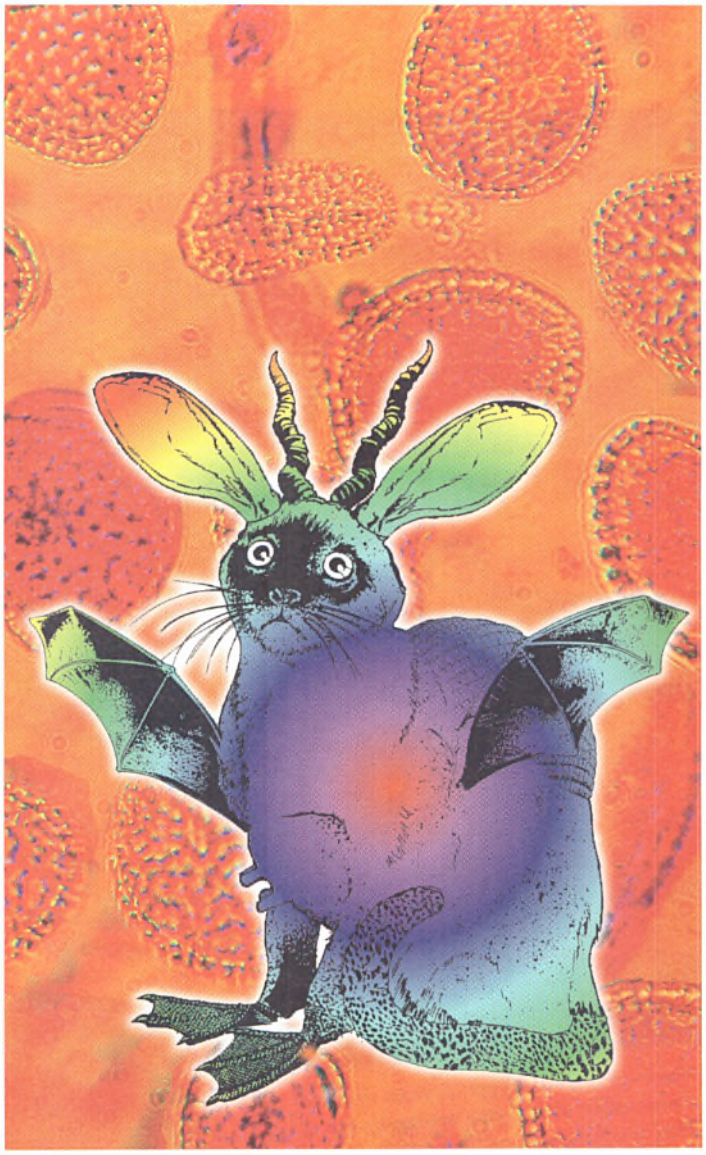
Enquiry No. My9

Inheritance considered harmful



Inheritance is generally thought to be a good thing. Robert Ennals thinks otherwise. He considers the principles of code reuse and the possible role of aggregation and dynamic typing.

One of the main aims of program design is to try to do what one wants with the minimum amount of code. In order to do this, one wants to be able to reuse as much existing code as possible. If you need to write functions to do several similar things, preferably these functions would share much of their code. But before we analyse methods of code reuse, we need to look at what we would like them to do.

It is useful to make code changes as easy as possible. If we want to change something which we have done in several objects, ideally we would like to have to make the change only once and that change should affect all the relevant objects.

If we are going to have objects sharing code which can change, we need to be sure that these changes do not break dependent objects. However, if we have a liberal method of code reuse, we may not know what objects are dependent on a change in the implementation of another object. We need to structure our code reuse in such a way that we know what changes we can and cannot make to an object in order to ensure that we do not break assumptions which other objects may be making about its behaviour.

Finally, another useful property is the easy ability to understand objects which reuse code from each other. We need to be able to understand both objects which use other objects, and those which are themselves used by other objects.

Most methods of code reuse are based around the two concepts of polymorphism and derived objects.

Polymorphism

Polymorphism is the ability of an object to work with other objects without having to know everything about them. A polymorphic function should be able to work with any object which is a member of a given set, even objects which were defined after the function or object which uses them was defined. One would like the set of elements which any object can work with to be as large as possible.

A simple example of polymorphism is a function which operates on integers. Take for example an `add` function, which adds two integers together. This function does not have to have separate code to handle every pair of integers which it might be passed. It can take any objects which are members of the set of integers and reason with them using its knowledge of the set.

One might think that such an `add` function is not polymorphic as it can only operate on integers, not on other types of number. However, integer is not the only set to which its members belong. Consider the integer 2. This is a member of several sets. It is a positive number. It is an even integer. It is a real number. Different functions can work with the number 2 based on what they know about any one of these sets. In my opinion the question we should ask is not whether a function is polymorphic, but *how* polymorphic it is. We don't want to know just whether a function can operate on more than one type, but how *big* a set of objects it can work on. We might want to go further and let `add` add together elements other than integers. We could extend the input set to include real numbers, complex numbers, or anything else which could be added.

The information needed to add these items should be contained completely within the definition of the set. This definition might include

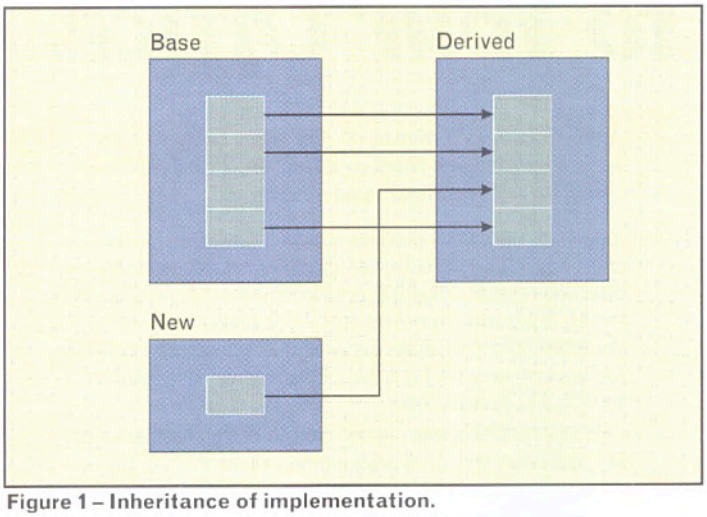


Figure 1 – Inheritance of implementation.

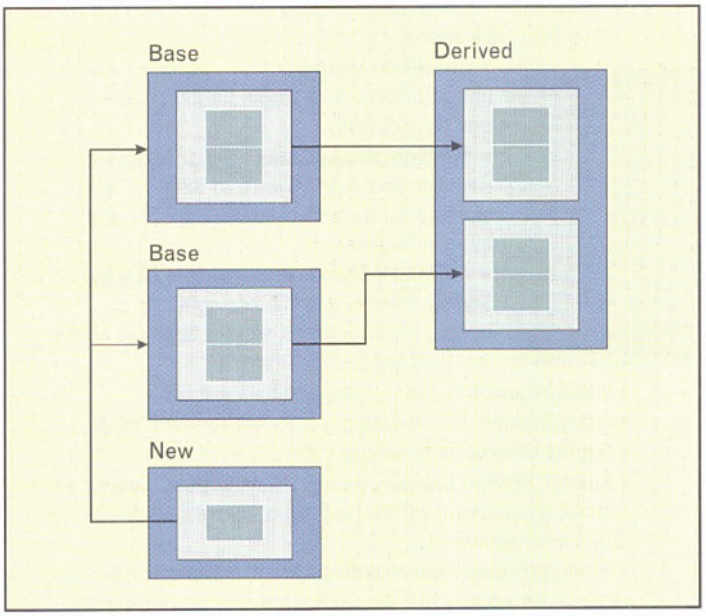


Figure 2 – Aggregation.

how additional information on members of the set can be found from the members themselves. For example, the set might define how one should go about asking an object to add itself to another object.

It is convenient to allow objects to belong to more than one set without those sets all having to be subsets of each other. I might, for example, have animals which can be either dogs or sheep and either male or female. We might wish to have objects which could manipulate 'males', without knowing what kind of animal they were, or manipulate 'dogs' without knowing what sex they were: an object should need to know as little as possible about another object in order to be able to work with it.

Derived objects

Another popular technique for enabling code reuse is deriving new objects from old. If we have an object which needs to do something, and part of what it needs to do has already been done by another object, we would like to be able to define the new object in terms of the old.

Perhaps one of the simplest examples of a derived object is a function defined in terms of another function. For example, we might have a function `sum` which summed all the integers in a list. We might already have a function `add` which can sum a list containing two elements, and it would be convenient to be able to define `sum` in terms of `add` without having to redefine addition.

Inheritance

Inheritance is a system of code reuse which is based around these principles of polymorphism and derived objects. It is widely used and generally considered a good thing.

Polymorphism in inheritance is based around the concept of an interface, which in this case is tied up with the idea of a base class. Here, a method is defined in a base class and is available in any objects which derive from that base class. An inheritance base class is a combination of an interface and implementation of the methods in the interface.

An interface is essentially a collection of methods which are defined as being available together. A method in such an interface can only be bound together with the other methods, and objects which implement an interface must implement all the methods. The information contained in the interface can help objects (wishing to use the methods defined) to work with any other object which implements the interface.

Actually, a fixed interface is a rather odd idea. By placing methods in interfaces rather than as separate entities, one requires objects to implement some methods in order to be able to implement others. It is impossible to bind to an individual method without binding to all the other methods. Often the wrong things are placed in interfaces together, and nasty solutions are used to implement some methods without implementing others. In OLE, for example, it is very common to implement an interface, but to stub out most of the methods with code which simply returns an error. This error code says that although the object implements the interface, it does not actually support that particular method of the interface.

If objects are allowed to implement only some of the methods of an interface, we do not know whether they support the methods we want unless we call them. But if the fact that an object implements an interface does not tell us whether the object implements the methods in the interface, what *does* it tell us? There is no logical advantage to forcing methods to be bindable only to part of a certain interface. Only the client can know what collection of methods it wants from objects it will work with. Logically, treating methods as independent entities and allowing clients to bind to whatever set of methods they want is a far more useful model.

Consider the example of an interface representing a sheep. This might contain methods describing its name and its wool. We might then decide that we wish to create an object representing a dog. However, if we are to provide the same `name` method defined in the sheep interface, we will have to make the dog implement the whole sheep interface and give the dog wool as well. We are thus forced either not to have polymorphism with sheep, or to twist the sheep interface and say that all dogs are a special kind of sheep.

Fans of interfaces will point out that the sheep interface was poorly designed and that `name` should have been part of a separate interface. I would extend this argument to every method in any interface and argue that every method should be in its own interface – ie do not use interfaces and just bind to the methods you want. In my opinion, the only reason why methods are forced to be part of interfaces is that it allows statically compiled binding to multiple methods to be performed reasonably fast. However, if compilation is dynamic, binding to an arbitrary collection of methods is just as fast as binding to a fixed interface.

Single inheritance of interface

At this point it is necessary to differentiate between inheritance of interface and inheritance of implementation. Inheritance of interface is the process by which a new object obtains the same methods as an old object and allows other objects to call it as if it was the old object. Inheritance of interface is thus a means of polymorphism. Inheri-

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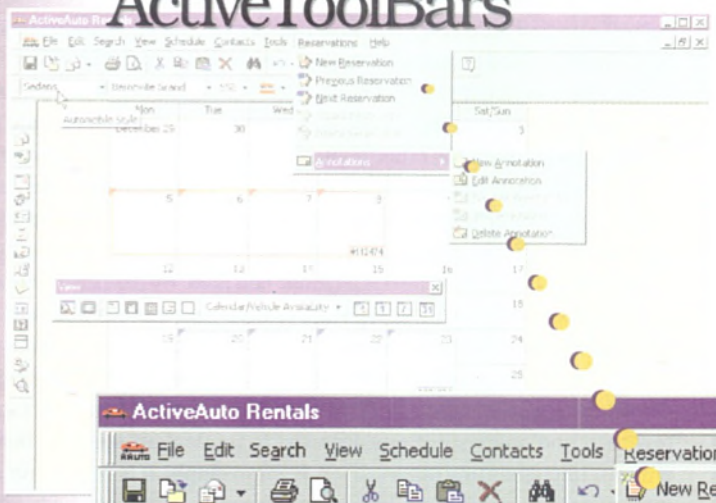

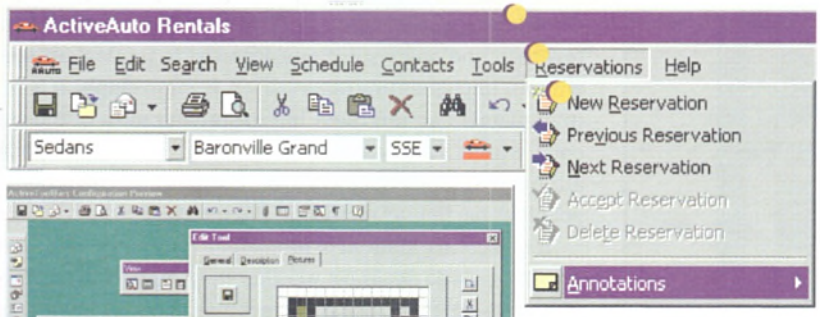

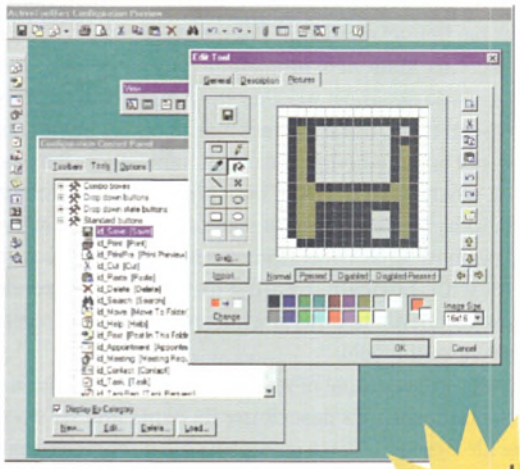

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Aggregation in COM

Aggregation is the method of code reuse in the COM object model. Unfortunately it is poorly implemented and poorly supported.

The official way to create an aggregate in COM is as follows.

For each base class, call `CoCreateInstance`, providing an outer `IUnknown` interface pointer for the base class object to be part of.

The base object then supplies a root `IUnknown` pointer on which the outer aggregate object can call `QueryInterface` to get various interface pointers from the base object.

When the outer object is asked for an interface which it gets from a base object, it forwards that call to the root `IUnknown` interface of the base object. This returns a pointer to the interface, which the outer object then returns to the client. If the client then requests an interface from this pointer, the base object sends the call back to the controlling outer object, even if the aggregate has that interface itself.

If a client requests (from an interface provided by the base object) another interface that the outer provides through the base object, then the call will be forwarded. It will go from the first base object interface, up the controlling `IUnknown` of the outer, and down to the root `IUnknown` of the base object. The COM `QueryInterface` delegation mechanism is represented in Figure 3.

It should be noted that base objects must provide two implementations of `IUnknown`. The one they provide to the outer object allows interfaces of the base object to be obtained and allows the base object to be referenced and released. However, the `IUnknown` implementation exposed to clients forwards all methods to the `IUnknown` implementation of the controlling outer object. This distinction can be confusing as normally all `IUnknown` implementations of an object will be the same and querying for `IUnknown` from an unknown interface would usually give you an interface with the same implementation.

One problem with the COM approach is that the base object is only given one pointer to the outer object, but it needs to do two things with it. It needs both to expose this object to client objects (eg by `QueryInterface` forwarding) and communicate with it in order to produce its own implementation (eg calling a draw method). This could be a problem if there was information which you wished the aggregate to have, but did not wish the client to have.

This is not a problem in the other direction. If a base object has a method which the outer needs to call, but that should not be exposed to client objects (eg a `fireEvent` method on an aggregate which handles event multicasting), then the outer object will simply not forward requests for that interface to the base object. The reason this cannot work the other direction is that the base object needs to use the same method call to ask for interfaces itself as to ask for interfaces for a client. Only one `IUnknown` pointer is provided in `CoCreateInstance`.

Because of this deficiency, aggregates are often constructed via methods other than `CoCreateInstance`. Often one will have a method in a DLL or in another object to create an aggregate base object, providing it not only with a controlling `IUnknown`, but other information as well. The most well known example of this is the `IDispatch` implementation object created by `CreateStdDispatch`. This takes, in addition to a controlling `IUnknown`, an interface pointer to wrap with the `IDispatch` and a type library interface pointer for it to call itself, but not provided to clients.

Unfortunately, having a multitude of custom ways to create aggregates is not a nice solution. It would be much better if Microsoft could provide an alternative to `CoCreateInstance` which allowed the outer object to provide an extra `IUnknown` pointer for the exclusive use of the aggregate. Tools for COM programming could then allow programmers to decide which base objects could see which interfaces and which interfaces were exposed to clients.

Aggregation is much underused in COM. Most code reuse is still static rather than dynamic. Very few people use COM aggregation and Microsoft provides few examples of its use. With COM+ Microsoft now seems set to abandon aggregation and use inheritance instead. I think that this is a most unwise decision.

tance of implementation is the process by which a new object obtains the same implementation for its own methods as an old object. These concepts are quite separate. However, somewhat confusingly, traditional inheritance often requires one to inherit interface and implementation together.

The most common way to implement interfaces in object orientated programming is to implement only one interface, and to define new ones by taking existing interfaces and adding new methods to them. If we were to create objects to represent our animals, we would not be able to retain polymorphism across both sex and species. We would either have to have male and female dogs as subclasses of a `dog` superclass, or have male dogs and male sheep as subclasses of a `sheep` superclass. If we do the former, we lose polymorphism over sex. If we do the latter, we lose polymorphism over species.

To take an example closer to real life, we might have a form on which there are several controls supporting different features. Some controls might support saving their state. Some other controls might wish to receive mouse events. Other controls might support both. With single inheritance of interface this arrangement would be very difficult to produce. Either all items which receive mouse events would have to be persistent or all persistent controls would have to receive mouse events. If the persistence and mouse event interfaces were created by different groups you wouldn't be able to implement both.

It is this last issue which causes the biggest problems. If one group controls the source tree, the problems of single inheritance of interface can be reduced to a manageable level. However, when software that is written by different groups needs to interoperate, it is completely impractical.

Single inheritance of implementation

With inheritance of implementation one creates a new object by taking an existing object (the base class object), replacing parts of it, and adding some extra elements. It is similar to the idea of defining a new function by taking an existing function and replacing some of the lines of code with new ones. As such, it is extremely hard to reason with a base class which is used with inheritance of implementation. See Figure 1.

Let us take for example a class which inherits from a base class which implements a stack. The base class has the standard `push` and `pop` methods for adding items to, and removing items from, the stack. Our new derived class inherits from this base class, but overrides `push` and `pop`, providing its own implementation of a stack. As it is providing its own implementation, the new class does not call the base

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class methods. However, consider what happens if the base class has a method `count` to return the number of items in the stack. This might be a method which the writer of the derived class did not notice, or one which was added to the base class after the derived class was written. As the base class `push` and `pop` methods have not been called, its implementation of `count` will return the wrong value.

If the stack class was not being used as an inheritance base class then we would be able to reason with its behaviour. We would be able to prove that the `count` method always returned the correct number, and that pushing and then popping left the stack as it was before. However, if the class is being used as an inheritance base class then methods can be replaced or called with different arguments to those supplied by the client. It becomes very hard to prove anything about the behaviour of a base class. And if you cannot prove what is going on then you cannot understand it either. Inheritance of implementation makes it very easy to produce unreliable and incomprehensible code.

Single inheritance of implementation also has the problem that the implementation can only be reused from one source. This can be extremely awkward as an object may do similar things to more than one other object. For example, our male dog might want to be able to share implementation with the generic dog and the generic male. Usually one gets round this limitation through manual delegation of methods to sub-objects, but this is a very awkward technique and means that one is no longer using inheritance to derive objects.

Multiple inheritance of implementation

Multiple inheritance of implementation allows new objects to be derived from multiple base classes. However, it does it in a very unstructured way.

Problems arise when base classes overlap. When using inheritance of implementation, it is generally considered to be good practice always to call the base class method in any overriding method, in order to preserve the base class implementation. However, if base classes overlap, their implementations may conflict. Things get even worse when inheritance is dynamic. Base classes may expand to overlap each other so that code which worked at design time fails at run time.

What then are the alternatives to inheritance? Dynamic typing. And aggregation.

Dynamic typing

Dynamic typing is a system of polymorphism used by many languages, including Smalltalk and Visual Basic. With dynamic typing one binds to methods individually rather than as part of an interface. For example, one might write a function which uses an object and refers to its `add` method. That function can then work with any object which has an `add` method.

C++ templates are similar to dynamic typing in that methods are bound to individually, but they are statically compiled to operate on certain object types. Being static greatly restricts what one can do with them. A template function can only work with object types which it knew it was going to be used with at compile time – one cannot dynamically cast objects into the type of a template argument. One might have a collection of objects of different types, all of which can be manipulated by a template function, but because one cannot dynamically cast the objects to the template argument type one cannot use the template function with them.

Aggregation

Aggregation is a term which is often used to mean many different things. I will describe aggregation as seen in COM.

It represents an alternative to inheritance of implementation. Aggregation is more structured than inheritance and allows one to produce objects with which one can reason far more easily than objects created by inheritance. While inheritance is like implementing a function by changing parts of the code for another function, aggregation is like creating a new function by taking the result of calling another function with certain arguments.

A derived class may contain one or more aggregate base classes. Each of these base classes may implement one or more interfaces. The derived class takes interfaces from the base classes and exposes them to the outside world. It may also provide interfaces to the base classes which they can call as part of the implementation of their interfaces.

With aggregation one cannot override methods of a base class. The derived class exposes the interfaces of the base classes without changing them. If the derived class wants to change the functionality of a base class, it must do so by providing code for the base class to call, or by not using the base class and implementing the interface itself instead. For example, we might have a base class which provides the basic functionality of a control and a derived class which provides the drawing of the control. With inheritance, the derived class would inherit from the base class and override the `draw` method to draw the visual representation of the control. With aggregation, the derived class would provide a drawing method to the base class and the base class would call this derived class drawing code.

Instead of taking all methods from the base class, as with inheritance, one specifies which interfaces one wishes to take from the base object. This allows one to aggregate safely from several base classes without the danger of overlapping implementation or problems of expanding base classes. One rigidly defines what is being taken from

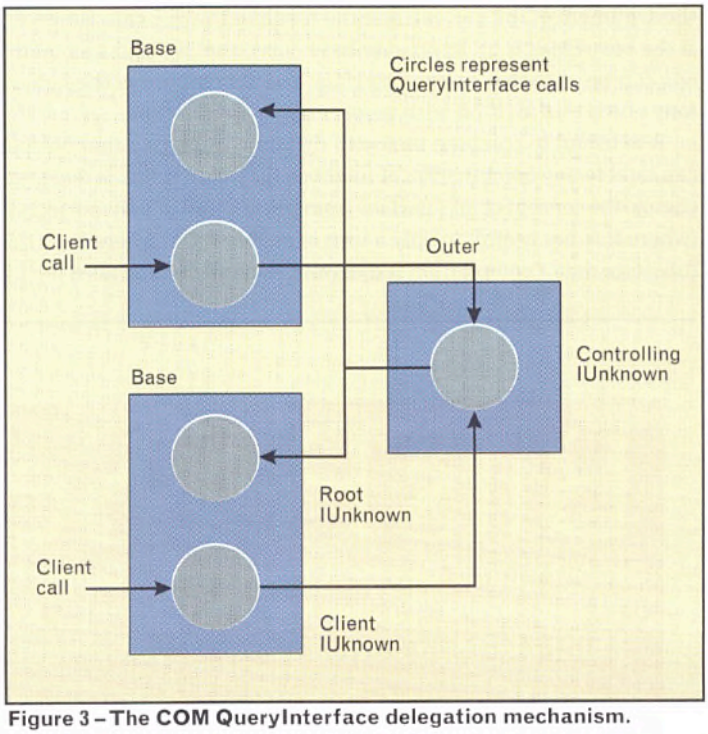

Figure 3 – The COM QueryInterface delegation mechanism.

each base class. See Figure 2 for a representation of aggregation, and the side panel *Aggregation in COM*.

Aggregation as it could be

COM aggregation does not make it significantly easier to reason with a base class. One can still aggregate different interfaces from different places. All it really does is add a larger grain to code replacement than inheritance does, as one replaces interfaces rather than methods. We might still have the problem that the `push`, `pop`, and `count` methods of our stack are in different interfaces and thus can be replaced individually by the derived class.

However, if one redefines the concept of an interface, we find that aggregation can be turned into an extremely powerful technique. If we allow an interface to contain whatever methods it likes, we can export interfaces from our aggregate base classes containing methods which must be taken together. If method implementations depend on each other, they will not be exported in separate interfaces. As aggregation only allows methods to be taken from a base class as complete exported interfaces, the derived class must either take all the dependent methods from the base class or none of them. It cannot take some and provide its own implementation for others.

This allows us to reason with a base class to a far greater degree than with inheritance. We can make guarantees about system behaviour when calls are made to methods which are exported together. When a client calls methods from the interface exported by the aggregate base class, derived class code is only called by the base class and thus the base class has complete control over what is going on. It is impossible for the derived class to remove functionality of the base class, to change method arguments, or to do anything behind the back of the base class. The derived class can only add new functionality or provide information to the base class to help create its functionality.

Consider a base class which has two methods. One method sets a value and the other method gets a value which depends on the value which was last set. If the base class is being used as an inheritance base class, we cannot guarantee any relationship between the argument of the `set` call and the result of the `get` call. However, if the base class is an aggregate base class, the `get` and `set` methods can be exported as one interface and we can prove the behaviour of the `get` method with respect to the `set` method.

It is useful to combine this with dynamic typing, so that objects can bind to any combination of methods they like. If this is done, we change the concept of an interface from being a unit of polymorphism (where it is not useful) to only a unit of aggregation (where it is useful). Note that if compilation is dynamic, dynamic typing need not be any slower than conventional binding to fixed interfaces. However, if compilation is static, building custom interfaces at runtime could cause a runtime overhead.

Design by contract

One common way to prove code is to use what is known as 'Design By Contract'. One places a contract on a function call which must be satisfied. This contract consists of an assertion, before the function call, on the arguments and an assertion, after the function call, on the results of the function call. For example, on a positive real number square root function one might require the input number to be positive and the output number to be positive. One can have invariants placed on a class which must always be true. On a stack class one might have the contract require that the count of items in the stack is always positive. Or one might require that when `pop` is called it returns the last item given to `push` and not yet popped.

Once one has defined a set of contracts on functions one can then go on to prove that these contracts are met. A divide and conquer strategy will prove that a function meets its contract provided the functions it calls meet their contracts.

If one is using inheritance, proving contracts is very awkward. There will usually be a need to look at not only the implementation of the base class but the implementation of the derived class. Take for example the requirement that `pop` returns the last object pushed by `push` and not yet popped. The derived class might have overridden `pop` but not `push`. In this case, one would need to look at the implementation of the base class *and* the derived class in order to prove that the `push` and `pop` methods interacted correctly to satisfy the contract.

By contrast, if one uses aggregation, the contract is much easier to prove. One knows at what points the code from the derived class is called and one can place a contract on the functions of the derived class called by the base class. It can thus be proved that the base class satisfies its contract by looking at the implementation of the base class and assuming that the derived class satisfied its contract.

Changing classes

Sometimes one may wish to change a class in such a way as to change the dependencies between method implementations. To continue with the simple stack example, one might have a stack implementation which always contained items of the same size. This stack might have a method called `usedmem` which returned the amount of memory occupied by the stack. As the items are all the same size, `usedmem` could work out the amount of memory used by looking at the contents of the `count` and multiplying it by the fixed item size. In this version,

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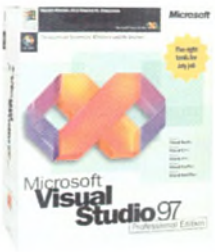

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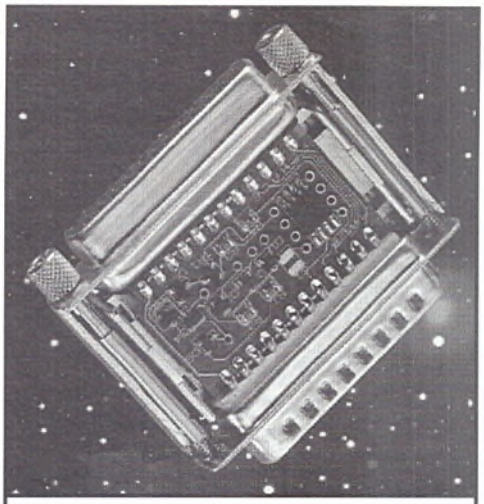

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Java and inheritance

In Java, code reuse is based on single inheritance of implementation and multiple inheritance of interface.

Java does not support aggregation. Its lack of multiple inheritance prevents one from even programming in the aggregation style. Thus it is interesting that Microsoft seems intent on making Java the main language for programming COM. If it does become the standard way to program for COM, aggregation will become even more rarely used than it is now.

Interestingly, it seems likely that future versions of JavaBeans may support aggregation. When using JavaBeans one cannot use standard casts to get different interfaces to an object. Instead, one has to use a special function to get interfaces. The JavaBeans spec suggests that this is because JavaBeans may in future support aggregation, but as Java casts do not support aggregation they cannot be used.

'In the first release of the JavaBeans architecture, each bean is a single Java object. However, in future releases of JavaBeans we plan to add support for beans that are implemented as a set of cooperating objects.

One particular reason for supporting beans as sets of cooperating objects is to allow a bean to use several different classes as part of its implementation. Because the Java language only supports single implementation inheritance, any given Java object can only extend a single Java class. However, sometimes when constructing a bean it may be useful to be able to exploit several existing classes.

JavaBeans Fundamentals

We therefore provide a notion of a type view that represents a view of a bean as a given type. In JavaBeans 1.0 all type views of a given bean simply represent different casts of the same object to different Java types. However, in future releases of JavaBeans, different type views of a bean may be implemented by different Java objects.

The rules included here are designed to ensure that Beans and containers written today will migrate smoothly to future JavaBeans implementations.

At the Java language level, type views are represented as Java interfaces or classes, but you must use the `Beans.getInstanceOf` *and* `Beans.isInstanceOf` *methods (see Section 10.4) to navigate between different type views of a bean.*

You should never use Java casts to access different type views of a Java bean.'

`usedmem` could be implemented separately from `push` and `pop` and might not be exported in the same interface.

If at some later stage one wished to change the implementation of the stack, such that it could handle items of variable size, the aggregation restrictions would need to change. If the stack could handle items of variable size, the implementation of `usedmem` would depend on the implementation of `push` and `pop` and would need to be taken from the same aggregate base class.

One must not change an existing aggregate base class to have stricter aggregate restrictions as that could break existing derived classes. If one needs to make a change which will alter the aggregation restrictions, one must create a new, distinct aggregation class. Any derived classes which satisfied the stricter restrictions anyway (eg they didn't provide their own implementation of `usedmem`) would be able to use the new class by simply changing from using the old class to the new class. However, any derived classes which didn't satisfy the stricter restrictions would have to change their implementation in order to use the revised base class.

Interface of the future

Inheritance, both of implementation and interface, has many problems. The alternative of aggregation seems promising, especially if the concept of an interface is refined to allow an aggregate to decide which method implementations are dependent and if it is combined with dynamic typing. ■

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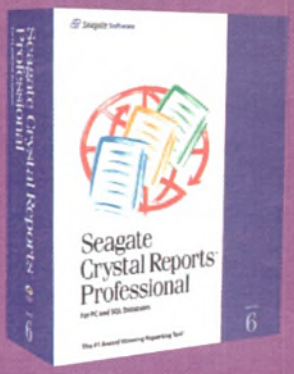

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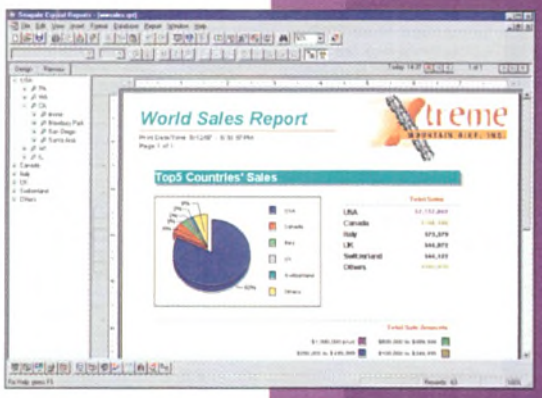

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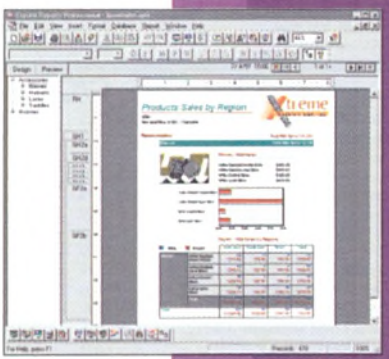

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PROGRAMMING FOR THE INTERNET

Java applet versus ActiveX

There have been debates about ActiveX versus Java from the point of view of a user, but which is really easier for the programmer? Gavin Smyth introduces the perspective of a developer.

Over the past few months I've read numerous articles and books on programming for the Internet, but I had not got round to doing much more than playing... Until now, that is. I've got a passing interest in genealogy and chose to make it my mission to display family trees on the Internet. After a bit of deliberation, I decided that it would be implemented as either a Java applet or an ActiveX control and this article addresses the question of which is 'better' suited, from the perspective of a developer, for this particular application. I'll describe the trade-offs between the two approaches and include solutions to some of the problems encountered along the way.

A problem with displaying genealogical information, as the sort of tree that people expect to see, is fitting everything in. There are two aspects to this. First, there are the details about each individual or relationship depicted – the person's date of birth, or photograph, or miscellaneous notes. Putting all of this on a picture clutters it up, so I chose just to place people's names on the chart and use a button click to get at the rest of the information. The second problem relates to the structure of the tree: a typical genealogical database is more complex than a tree – there may be many links up and down the generations. I realised that when I look at such a database I'm most interested in the branches extending from one individual outwards (the 'root'). The user could click on someone else featured on the tree to cause that person to become the centre of attention to explore the whole database.

Speed versus portability

There were a number of development alternatives (see the box out). But having decided that I would write either an ActiveX control in C++ using the Microsoft Foundation Classes (MFC) or a Java applet, for me, the most significant trade-offs were speed versus portability:

- A Java applet is very portable, but it cannot be used outside a browser (not quite true: Sun's ActiveX bridge and Microsoft's Java Virtual Machine let you use JavaBeans as ActiveX objects).
- ActiveX controls will be very efficient – Java, even with a Just In Time compiler, cannot help but be slower in this application where the bulk of the work is traversing pointer based data structures.

A few less important aspects were:

- An ActiveX control is restricted to the Windows 32 platform and furthermore, it will only be usable over the Internet by Microsoft's Internet Explorer. (Again that's not quite true: NCompass produces a plug-in, ScriptActive, which permits ActiveX controls to be used in Netscape Navigator.) However, the control can easily be embedded in other applications such as Word or programs written in Visual Basic.
- Because I'm using a subset of Java 1.1 (no AFC or Swing – see later) the applet's appearance will be rather primitive whereas the ActiveX control will conform to Windows styles.
- I'm not at all concerned with issues of security here. I'm developing this control/applet for myself and friends and I don't really care if no-one else trusts me enough to download it. I should also point out that there's very little in the component that needs to execute outside Java's sandbox. I have no intention of using native code extensions with Java, such as Microsoft's J/Direct, since the main reason for examining Java is its portability.

From that short list, there was no obvious answer to the question about which development scheme was better. I decided to implement a subset of the control in both and then decide. This partial component had a fairly straightforward specification: read in a preprocessed GEDCOM file (a common genealogy data file format) containing a number of individuals and relationships, and display a tree fanning out from some root individual. The display should be scrollable, and clicking on any individual's name should pop up a dialog box with extra information about that person.

A preprocessing stage simply converts a GEDCOM file into two lists of `Individuals` and `Family` elements (the two data structures making up the tree) in a form which can easily be read by the applet/control. There's little point in making the downloaded component do more work than is necessary. The only thing worth noting about this preprocessing stage is byte order. The ActiveX control runs as native 80x86 code, and therefore is little-endian; Java's external data representation is big-endian. Rather than force an inefficient data stream structure on to one or other implementation, I just produced two forms of the preprocessed data file.

The bulk of the code to be written deals with laying out the tree rooted in a single individual. This occurs in two passes. First, calculate the widths required for each individual based on the width of its name string and the width required by its children or parents. Sec-

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ond, having calculated the widths, position the name strings. This has to be carried out in two passes because the width of any individual depends on all the individuals further from the root along that subtree. Pseudo-code for positioning children is shown in Listing 1, and parent positioning is very similar.

As a result of applying this process to the data read in, the location of each individual is known, and it only needs to be recalculated if the root individual is changed. After that, the control has to manage a scrollable area, into which all the individuals accessible from the root are drawn, along with the lines between them and their parents/children. All fairly straightforward code.

ActiveX with VC++ and MFC

The Visual C++ AppWizard and ClassWizard assisted greatly in producing the framework for the control. Some of the C++ code is opaque but the wizards mean that doesn't really matter. When I wanted to add a colour property I just had to click a few buttons and I was presented with a `getLineColor()` and `setLineColor()` pair of access functions (sorry about the American spelling, but I was being consistent with the ambient colour properties). The wizards let you delete properties and class members, but don't do the complete job – you still have to chop text out of the source files.

Since ActiveX controls are geared to more than the Internet, the development process gave me much more than I really wanted here. For example, it was my intention that the control would read its properties (such as line and text colours) once at the beginning and they would not change for the control's lifetime, as would be the case when initialising from HTML page parameters. However, the ability of the ActiveX control to interact with any of a number of containers implied that I would be ill-mannered to ignore changes. In fact, this ability is almost essential to be able to use Visual Basic as a container. Since the VB development environment permits you to change the properties of controls embedded in a VB project, not allowing changes would make using the control rather awkward.

The actions the control has to perform map well on to MFC functionality, and particular points to note are as follows. First, initialising from HTML `<PARAM>` tags just means defining ActiveX properties (creating the *get* and *set* functions) – everything else happens behind the scenes. Second, reading from an URL is as easy as reading from a file (see Listing 2). Finally, scrolling is easy to arrange – scrollbars can be added to a window with `SetScrollInfo()` and `ShowScrollBar()`, and `OnHScroll()` and `OnVScroll()` are called when the scrollbar is used.

After building the control, an OCX file, I could have deployed it directly on a web page, with an entry like that in Listing 3.

The `CODEBASE` line indicates where to pick up the control. However, this has a couple of undesirable features. First, since the control uses MFC, what happens if the MFC DLLs are not present on a user's machine, or what if they're an old version? Second, the control is rather large. Is there any way to make it smaller? Microsoft is promoting cabinet file technology – these are a bit like ZIP files, and Internet Explorer understands what to do with them. The Cabinet file creation tools can be found either in the cabinet SDK (*http://www.microsoft.com/workshop/prog/cab/cab-sdk.exe*) or as part of Microsoft's Java SDK, and instructions may be found along with both of those. To define a cabinet, I needed to create an `INF` file containing my control and references to the correct versions of MFC and C++ runtime library DLLs, as shown in Listing 4.

You can make Visual C++ generate the cabinet file for you. For ActiveX controls, the Visual C++ application wizard inserts a post-

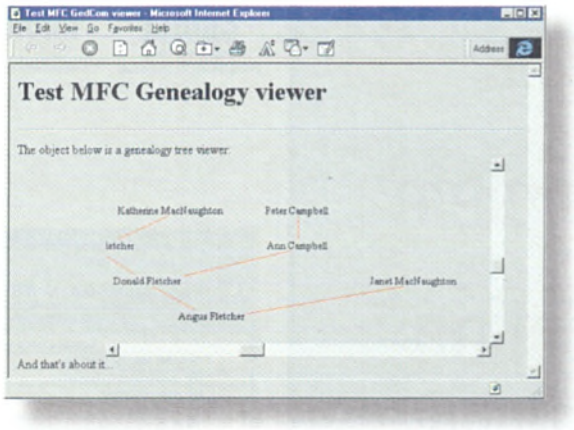

Figure 1 – ActiveX control embedded in an IE page.

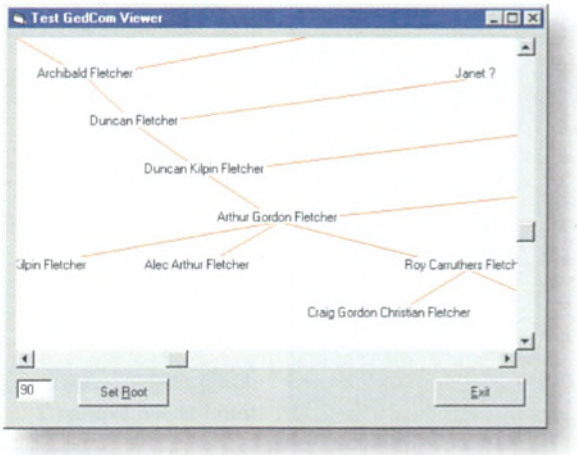

Figure 2 – ActiveX control embedded in a VB application.

```
void positionEverybody( Individual* root )
{
   int overallWidth = calcWidthDown( root )
   setPosDown( root, 0, 0 )
}

int calcWidthDown( Individual* individual )
{
   if individual is already done
      return its width
   else
      width = width of the name in the current fount
      childWidth = 0
      for each family with this as a parent
         for each child in each family
            childWidth += calcWidthDown( child )
                                 + spacing
      if childWidth > width
         width = childWidth
      mark as done
}

int setPosDown( Individual* individual, int x, int y )
{
   individual's x position = x + individual's width / 2 -
          name's width / 2
   individual's y position = y
   current x = x
   for each family with this as a parent
      for each child in each family
         current x += setPosDown( child,
                     current x, y + spacing )
   return individual's width
}
```

Listing 1 – Pseudo-code for positioning children.

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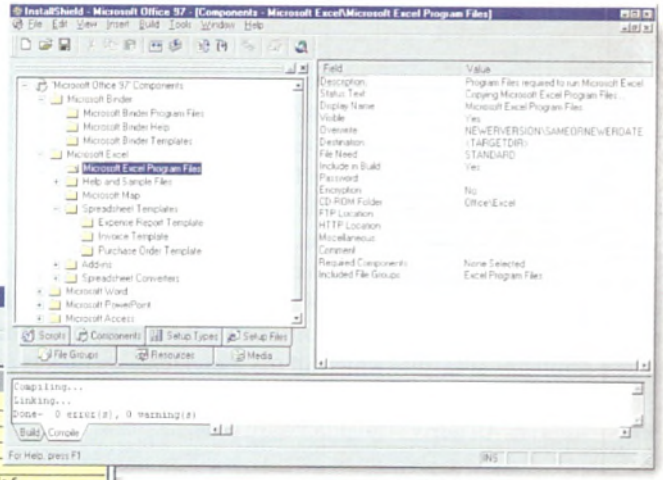

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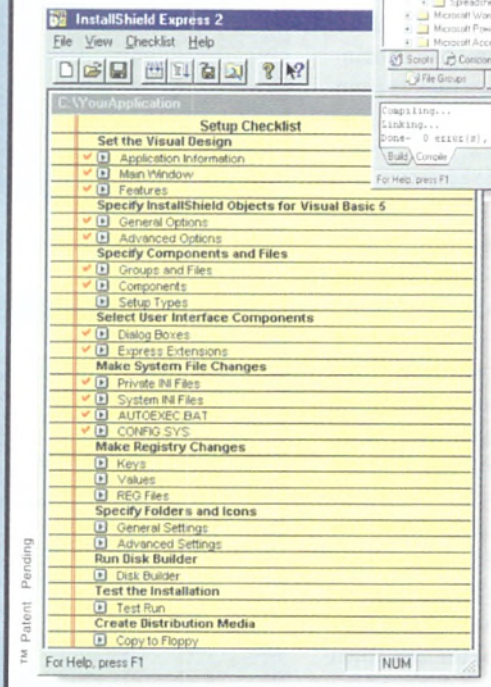

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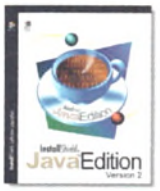

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build command to register the OCX. With the following command the cabinet will be created automatically:

```
<cab SDK path>\bin\cabarc N
$(OutDir)\$(TargetName).cab $(TargetPath)
$(ProjDir)\$(TargetName).inf
```

The CAB file can be used in a slightly modified form of the web page. Simply replace the CODEBASE line with:

```
CODEBASE="http://localhost/genviewer.cab"
```

When a user accesses that page, if the ActiveX control is not registered locally or is an earlier version than the one specified, the browser will grab the cabinet file from the CODEBASE location and unpack it. The OCX control will be registered and the other DLLs' version numbers checked. If they're not present or they are earlier versions, the browser will pop along to the Microsoft site and grab them. (I hope that most users will already have the MFC DLLs from other programs' disk based installations since the download is rather large!)

Microsoft's cabinet system also allows some form of authentication. I could generate a signature and embed that in the cabinet, so that a user can be confident that someone (the certificate publisher) trusts me and that the cabinet file has not been tampered with since I last touched it. However, I would have to pay the certificate publisher a small sum for this service, and I'm not particularly interested in spending money in this way. My control will remain unauthenticated. Without a signature, anyone downloading the cabinet will get an irritating warning message, but it does appear only once since the message is generated only on download, not on subsequent use of the installed control.

Visual C++ development made it trivial to add About boxes, property pages, and icons, and I built a few different variants to get an idea of the final control's size. With only the minimum of changeable properties, the control was about 26 KB and the cabinet file about 12 KB. Adding a few more bells and whistles such as property pages, it grew to 30 KB/14 KB.

Figure 1 shows the ActiveX control in an HTML page. To debug an ActiveX control, you need to embed it in something: the obvious application is Internet Explorer, but this is large and takes quite a while to load. I threw together a tiny VB application to host the control and used this instead – it was much quicker to load. See Figure 2. The same could be done in C++, but it means a bit more work.

```
const DWORD Context = 1;
CFile* f = NULL;
try
{
   CInternetSession Sess;
   f = Sess.OpenURL( Source, Context,
            INTERNET_FLAG_TRANSFER_BINARY |
            INTERNET_FLAG_RAW_DATA |
            INTERNET_FLAG_EXISTING_CONNECT );
   if( !f )
      AfxThrowInternetException( Context );

   int Magic, Version;
   f->Read( &Magic, sizeof( int ) );
   f->Read( &Version, sizeof( int ) );
   if( Magic != 0xAB875433 || Version != 0x00010003 )
      AfxThrowFileException( CFileException::invalidFile );

   f->Read( &NumIndividuals, sizeof( int ) );
   ...
}
catch( ... )
{
   AfxMessageBox( "Could not read source",
                  MB_ICONEXCLAMATION );
   delete f;
   Destroy();
}
```

Listing 2 – Reading from an URL in C++.

Alternatives

One alternative approach was to have written a plug-in instead of an ActiveX control. The development process would have been very similar, the unit could run in any Windows 32 browser, and it's easy to port the result to different operating systems (unlike ActiveX technology at the moment). The user would have to perform a separate download and install step, but that would not be too onerous. I would have had to invent a new MIME type, so that the browser would know when to invoke the plug-in, but again, that's not arduous. The major difficulty with a plug-in is debugging it – a small and quick to load VB or C++ application can host an ActiveX control, but the host for a plug-in really has to be a browser.

Instead of MFC, I could have relied on the ActiveTemplate Library (ATL). Interestingly, I found that the component produced with this was much larger than the MFC one. The reason for this is that the ATL component relies on very little else being present at the destination whereas the MFC component requires the MFC DLLs to be there.

Another ActiveX implementation language is Visual Basic, of course. This would produce a small component (though reliant on the large VB runtime DLL). However, I did not want to write recursive tree scanning code in VB.

Finally, it's worth remembering that the code which runs within the browser is not Java – it's the compiled Java bytecode, sometimes called J-code. There's no reason why Java should be the only source language. A number of companies have produced Ada compilers which emit J-code: I'm quite fond of Ada (*Ada better than C++?* EXE, May 1997) and, although it'll almost certainly result in no more compact an applet than Java, I'm interested in pursuing this avenue further. Aonix has made a restricted version of its ObjectAda compiler, which includes Java 1.0 support, available for download (*http://www.aonix.com*).

Java applet development

The Java executable environment is somewhat confused at the moment. For example, IE3 provides Java 1.02 plus Microsoft extensions, but you can add Microsoft's latest JVM to get the most of Java 1.1, while IE4 provides Java 1.1. You can add Sun's JavaActivator to make both of those much closer to the 'standard' Java 1.1. Netscape 4 presents yet another Java 1.1 JVM, and 'patch J' brings this up to the latest standard. Because I want this applet to run on a good number of variants, I've decided to aim for something which will run under Java 1.0 JVMs (you can safely use Java 1.1 language modifications as long as you steer clear of the new classes).

As I do not have any serious form of Java development environment, this was more or less developed using command line tools, such as Sun's JDK and Microsoft's equivalent. Visual J++ is very basic, providing not much more than edit, compile, point to error functionality for this application – I found its debugging abilities unusable here. Having said all that, coding the applet in Java was much easier than C++ would have been without its wizards.

The following are particular points of note. First, initialising from HTML <PARAM> tags just requires code like the following few lines, with some error trapping added:

```
param = getParameter( "Root" );
if( param != null )
   root = Integer.parseInt( param );
```

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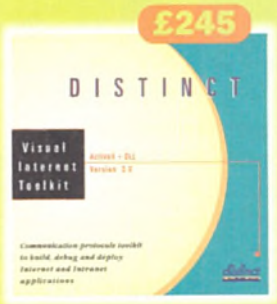

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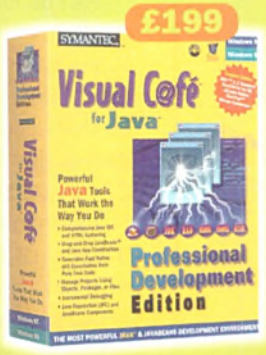
for Java



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In this case, the applet's properties are definitely readable only once, and cannot be changed, meaning that I did not have to add code to cope with their changes. Second, the lack of pointer manipulation showed up in only one area. Having a background in real-time systems, I am always aware of heap fragmentation issues and don't like allocating a lot of small blocks when I can manage one big one. The tree data structure has many short lists of pointers and in C++ I created a single vector of pointers, letting each short list refer to a segment of that. In Java I'm forced to allocate each individually – although this is not going to have any effect on speed, I'm sure it drastically increases the data space requirements. Finally, reading from an URL is again as easy as reading from a file (see Listing 5).

One of the Java sandbox rules is that an applet can access no local files. Recall that one of the inputs is a source data file and you can see where my problem lay. I could not run the code as an applet *and* access the file locally. One possibility was to wrap it up as a Java application (effectively writing my own simple applet viewer), which would be able to read the local file system – more work than I wanted to do. Alternatively, I could have placed the file on some other machine and accessed it off the Internet – hmmm, a bit expensive on telephone calls. This was when I wished I had allocated more space to my Linux partition and installed a web server. Instead, I was stuck with Windows 95. I found a rudimentary web server in an old issue of the *Microsoft Systems Journal* (February 1996 – the article is in the MDSN library, and the code can be found online) which runs quite happily on Windows 95. (If you don't have, or want, Visual C++, there's an even simpler one written in Java, in the O'Reilly book *Exploring Java*.) Now I could test the applet as long as I referred to the data file as `http://localhost/...` and it all ran quite happily, albeit somewhat slowly on my clunky and under-powered PC.

The result of the compilation process is a number of class files, totalling about 10 KB for the most basic form of the control. I was surprised at how much smaller than the ActiveX control this was. Adding extra features such as typeface and colour selection bumped that up to about 11 KB. It's a bit of a nuisance to have multiple files since downloading each is a separate HTTP transaction – could I create anything like cabinet files? Yes: Internet Explorer can handle cabinet files for Java exactly as it does for ActiveX controls but unfortunately no other browser recognises them. Sun has specified an approximately equivalent system to cabinets, the JAR file. However, this is rather new and not many browsers support JAR files. Netscape Navigator 4 and IE 4 do, but unfortunately IE 3 does not, and guess what my power-challenged PC has....

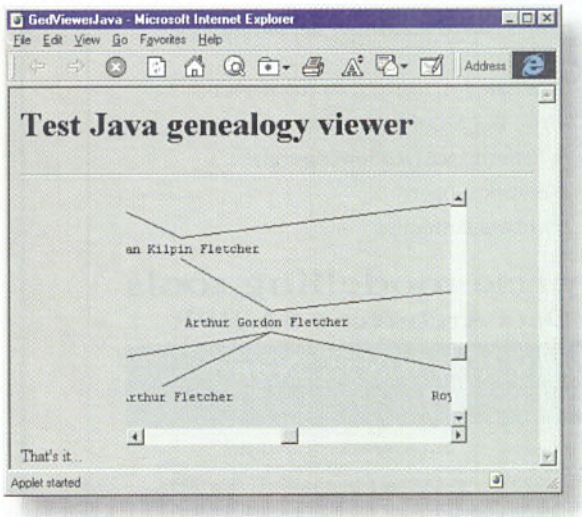

Figure 3 – Java Applet embedded in an HTML page.

```
<OBJECT ID="Viewer" WIDTH=500 HEIGHT=250
     CLASSID="CLSID:26F313E6-424B-11D1-A8C5-
              444553540000"
     CODEBASE="http://localhost/genviewer.ocx"
  <PARAM NAME="Source"
         VALUE="http://localhost/test.bin">
  <PARAM NAME="Root" VALUE="70">
  <PARAM NAME="LineColor" VALUE="255">
</OBJECT>
```

Listing 3 – Embedding the ActiveX control in an HTML page.

```
[version]
  signature="$CHICAGO$"
  AdvancedINF=2.0
[Add.Code]
  GenViewer.ocx=GenViewer.ocx
  msvcrt.dll=msvcrt.dll
  mfc42.dll=mfc42.dll
  olepro32.dll=olepro32.dll
[GenViewer.ocx]
  file-win32-x86=thiscab
  clsid={26F313E6-424B-11D1-A8C5-444553540000}
  FileVersion=1,0,0,2
  RegisterServer=yes
[msvcrt.dll]
  FileVersion=4,20,0,6144
  hook=mfc42installer
[mfc42.dll]
  FileVersion=4,2,0,6256
  hook=mfc42installer
[olepro32.dll]
  FileVersion=4,2,0,6068
  hook=mfc42installer
[mfc42installer]
  file-win32-x86=http://activex.microsoft.com/
          controls/vc/mfc42.cab
  run=%EXTRACT_DIR%\mfc42.exe
```

Listing 4 – INF file to create a cabinet.

Creating a JAR file is as easy as creating a cabinet:

```
jar cvf genviewer2.jar genealogy/*.class
```

Microsoft claims that cabinets have better performance – the files are combined and then compressed whereas with JAR files, the individual elements are compressed and then combined. It does look like Microsoft is right in this particular instance: my JAR file was 6 KB while the cabinet was only 5 KB. JAR files can have authentication signatures but as far as I am aware, this is not supported by any commercial browsers. Thus if I want to use Java it looks like I had better just leave the files as individual class files. Unfortunately, some web server platforms have restrictions on file names. Java 1.1 inner classes result in class files with dollar symbols in their names, and it may not be possible to host them outside JAR files or cabinets (this is the case for my ISP).

The feature I found most annoying when debugging the applet was that browsers tend not to reload Java class files once they're in the cache. I had to keep quitting and restarting the browser to see the effect of any changes.

The Java applet is shown in Figures 3 and 4. It is rather slow. The applet took about four times longer than the ActiveX control to load and produce a tree display. I mentioned earlier that the Java 1.1 GUI style is rather basic and the dialog box is distinctly clumsy looking. Microsoft has developed the Application Foundation Classes (AFC), a set of classes to give a much more sophisticated user interface style and, of course, there is a Javasoft equivalent, the Java Foundation Classes, or JFC (this contains more than the AFC, but I'm only inter-

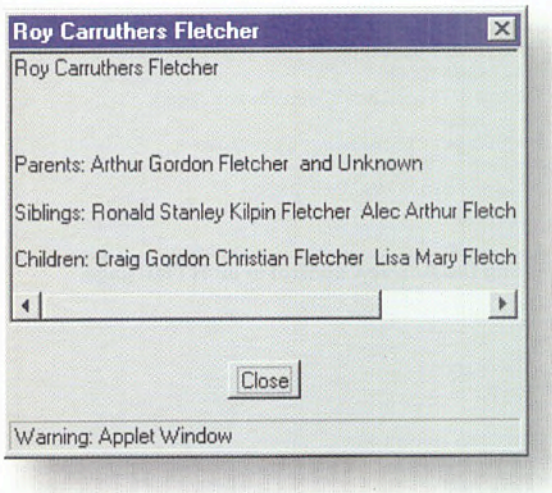

Figure 4 – Java applet dialogue box.

ested in the user interface bits). Microsoft has not gone out of its way to make AFC available to any browser. However, it is pure Java and it will run anywhere if you repackage it. The JFC is still in beta but the user interface parts, known as Swing, are available if you care to download them. Both the AFC and JFC look much better but they are both even slower, so I'll stick with the AWT for the time being.

Further down the road

As I expected, the ActiveX control is a lot snappier and neater looking than the Java one. However, once all the class files had loaded, there was not very much difference in speed, and a little bit more work will reduce the difference in appearance.

The Java applet compiled to a smaller binary, but there's not much difference between the ActiveX cabinet and the set of Java class files and, with separate HTTP transactions for each class file, the latter takes longer to download. Of course, if you need to download the MFC DLLs too, matters change somewhat! Associated with binary size is the amount of memory taken up when the component is running – this will be a combination of executable size, already present binaries such as the Java virtual machine or MFC DLLs, and data space. One crude way to measure this is to have a look at Windows' memory usage statistics. With IE addressing a blank page, Windows 95 reported 55 MB of memory allocated. Loading a page with the ActiveX

```
try
{
   URL url = new URL( m_Source );
   DataInput is = new DataInputStream(
           new BufferedInputStream(
              url.openStream() ) );

   int magic = is.readInt();
   int version = is.readInt();

   int numIndividuals = is.readInt();
   ...
}
catch( Exception e )
...
```

Listing 5 – Reading from an URL in Java.

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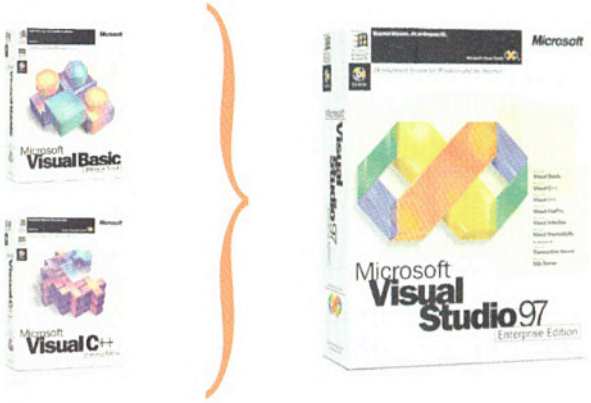

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References

Microsoft Java SDK (including latest JVM)
http://www.microsoft.com/java/download.htm

Microsoft Visual J++ trial edition
http://www.microsoft.com/visualj/download/

Microsoft cabinet SDK
http://www.microsoft.com/workshop/prog/cab/

MSJ code download
http://www.microsoft.com/msj/code.htm

Sun's JDK
http://www.javasoft.com/products/jdk/1.1/index.html

Java Foundation Classes (Swing)
http://www.javasoft.com/products/jfc/index.html

ActiveX bridge
http://www.javasoft.com/beans/software/bridge/

NCompass plug-in
http://www.ncompasslabs.com/ScriptActive/

control reported 60.5 MB allocated and repeating with the applet resulted in 64.5 MB allocated. This implies that the Java applet and engine take up a lot more memory than accessing the ActiveX control.

Another issue related to download times is that Java class files are merely cached when used: when the cache expires, the files will be downloaded again. Of course, a user could download my class files (or a JAR file, if a suitable browser is being used) and store them somewhere on the `CLASSPATH`. On the other hand, once the ActiveX control is downloaded, it is installed on to the destination system, and will not be downloaded again unless the version number indicates that the stored one is old.

Finally, although the C++ code is considerably more complex, there was little difference in development effort thanks to the Visual C++ wizards.

I started this evaluation of ActiveX versus Java expecting the C++ with MFC route to win and was surprised how easy it was to produce a reasonable Java applet. In this particular application, I think that Java is the better solution, despite slower speed and greater memory requirements, and I will be completing the development in that language. Another useful feature of Java I have yet to investigate is compressed data streams. I did not mention the size of the preprocessed data file since it was the same for both implementations, but it is quite significant and compressing it is something I wanted to investigate – `java.util.zip.GZIPInputStream` and serialization could let me handle that with minimal effort. If you're interested, you can see my efforts at *http://www.beesknees.clara.net/genealogy/*.

Of course, this doesn't mean I'm giving up C++ development in favour of Java. Each language has its place. In this application, with only a single server transaction, negligible host operating system interaction, and simple user interface, Java provides no worse a solution than C++, apart from startup time, and it is smaller and more portable. ■

Gavin Smyth is a real-time software engineer and part time Windows and Linux hacker. He can be emailed at gavin@beesknees.clara.net.

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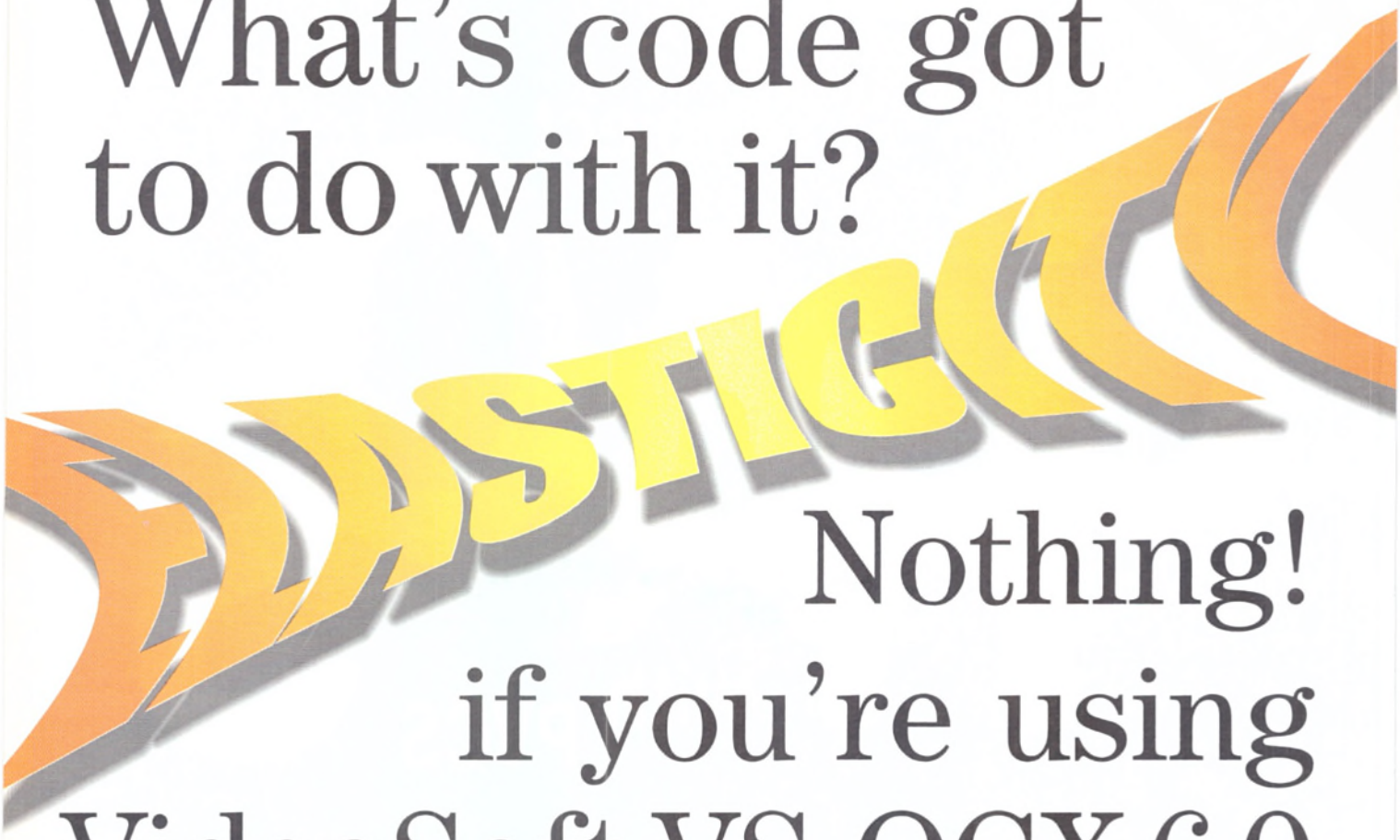

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VS-OCX has a small footprint and can be distributed without additional DLLs.

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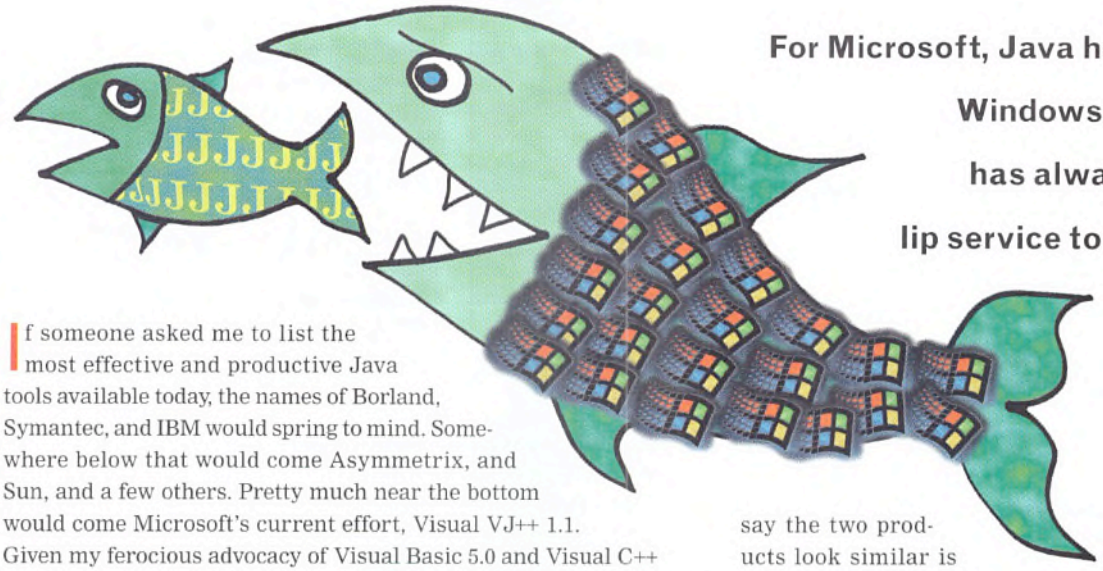

For Microsoft, Java has always been about Windows. Until now, Redmond has always paid at least some lip service to cross-platform Java. But, as Neil Hewitt finds out, Visual J++ 6.0 seems set to change all that.

If someone asked me to list the most effective and productive Java tools available today, the names of Borland, Symantec, and IBM would spring to mind. Somewhere below that would come Asymmetrix, and Sun, and a few others. Pretty much near the bottom would come Microsoft's current effort, Visual VJ++ 1.1. Given my ferocious advocacy of Visual Basic 5.0 and Visual C++ 5.0, this might seem strange, but anyone who's actually tried to use VJ++ 1.1 in anger will probably be muttering in agreement even now.

Microsoft chose to take a code-centric approach to Java development, when the rest of the market was heading resolutely for RAD tools. I suspect this was because Microsoft wanted VJ++ 1.1 to appeal to C++ programmers, who haven't really caught the RAD bug (despite the best efforts of Borland). As it turned out, this was a mistake, because most of the people looking to get into Java seem to be coming from a less traditional, more Visual Basic or Delphi-oriented background. At the same time, the company began to emphasise its philosophy that Java was just another good language for developing Windows applications – a philosophy set in stone when the updated VJ++ 1.1 included support for building COM objects in Java and native code compilation. J/Direct followed in direct opposition to Sun's RMI. Then came The Lawsuit, which still drags on. This seems to have been all the impetus the Visual VJ++ development team needed to take the final plunge and stop promoting VJ++ for cross-platform development in any shape or form, which is – basically – what they've done.

An early beta (or 'Technology Preview' in Microsoft-speak) of the next release of Visual VJ++, version 6.0, is available for download, though it's huge. Normally, we wouldn't present a review of a product like this until we could get our hands on gold code, or at least a very late beta. However, Visual VJ++ 6.0 threatens such a sea-change in Java development on Windows that we thought you deserved to hear about it sooner rather than later. The usual caveats must apply: the feature set of the product may well change significantly before release, so I won't dwell on things which are 'missing' from the product except where Microsoft has already said that they won't be included in the final release. I have also refrained from commenting on the performance of the compiler or the speed of the IDE, because beta code can't be expected to perform as well as production code.

Déjà VB

Upon booting up the Visual VJ++ 6.0 IDE (see Figure 1), you could be forgiven for thinking you had mistakenly started VB 5.0 instead. To say the two products look similar is an understatement. The experienced eye will notice subtle differences (the properties dialog isn't quite the same, and the toolbars have been slightly revamped) but otherwise the similarity is eerie. This is no surprise; it's been unofficially common knowledge for some time that the Visual Studio 98 tools would share a new common interface based on the VB look and feel, to replace the existing code-centric Developer Studio. Visual InterDev 6.0, which is also in beta, sports an identical interface. As with Developer Studio, most of the interface code is shared between the applications, blurring the distinction between the tools even further. This is clearly going to be the model for Visual C++ and VB 6.0 as well, although Microsoft will not publicly comment on this.

On start-up, the familiar New Project dialog pops up, inviting you to choose from the project types on offer. The 'Java application' option currently available in VJ++ 1.1 has been superceded by a 'Windows

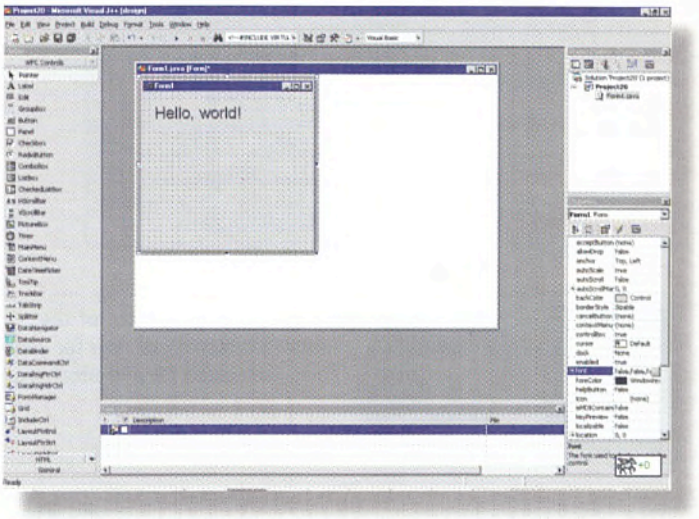

Figure 1 – The Visual J++ 6.0 IDE – note the WFC palette down the left-hand side.

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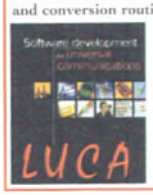

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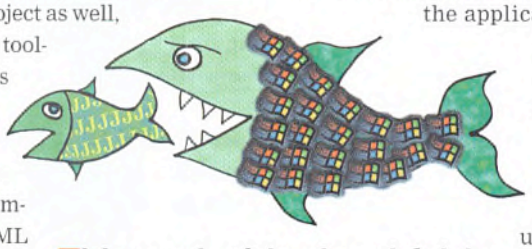
application' option, which is a pointer to things to come. You can also use the Application Wizard, create a console application (which will only run on Win32), a COM control or DLL, and the more traditional applet-plus-HTML combo.

Assuming for a moment that you are writing a Java application, the Form Designer is then invoked which again looks practically identical to its VB counterpart. This is where a traditional Java developer is likely to get a shock.

In Visual VJ++, it is not possible to visually create an AWT form. Let me say that again: in Visual VJ++, *it is not possible to visually create an AWT form*. If you intend to use AWT controls in your project, they must be added in at the source code level (and you must remember to import `java.awt` into your project as well, because by default it is not imported). The toolbox supplied by Visual VJ++ consists entirely of Windows Foundation Class (WFC) controls. For the uninitiated, WFC is Microsoft's new Java class library set which wraps the Win32 API, its common companion APIs, and the Dynamic HTML libraries. As this implies, WFC is Windows-only since almost all of its functions are implemented through J/Direct. This means that the moment you add a control from the toolbox to your project, your application immediately ceases to be cross-platform.



This product is aimed fairly and squarely at those developing on Windows for deployment on Windows.

If there was any stronger message Microsoft could give about how it regards Java as a cross-platform development language, I would be surprised. Clearly this product is aimed fairly and squarely at those developing on Windows for deployment on Windows. Technically it's still possible to write an entirely portable application using AWT, but this will have to be done in source code and all the Win32-dependent libraries and imports which are included by default in every project must be turned off. It's certainly difficult enough that you wouldn't want to do it.

Having said that, it's nice to have a good set of basic widgets which is as rich as those you'd find in any other RAD environment. It's also nice to be sure that your application looks and feels like a native to the OS it's running on, even if this is only because to a great extent it *is* a native. WFC components can be dragged and dropped onto a form just like VB controls. It also goes without saying that any VB-compatible ActiveX control can be added to the toolbox and used in situ. VJ++ takes care of the wrapping for non-Java COM objects, and the message translation that is required. There are also a large number of design-time controls for building data connections, as in Visual InterDev and (once again) VB.

WFC provides all the controls that are available in the Win95/WinNT environment, including ListViews and TreeViews, plus a wide variety of data access controls – DataSource, DataBindings, etc – with a range of data-bound controls. Data connectors were supplied for ODBC, Jet, Oracle, and Informix in this release. A number of objects are provided to allow Java programs to create and manipulate Dynamic HTML code – useful for server-side apps.

Prompt!

VJ++ 6.0 includes one feature taken from VB 5.0 that I for one would have been willing to kill to have – method and parameter prompting (see Figure 2). If you've used VB 5.0 you know what a godsend this is. If not, you've been missing out. Any functions or classes you add to your project are incorporated automatically into the prompting scheme as soon as you create them, which impressed me no end. This means that VJ++ is monitoring the source code of the application very closely in real-time. The parameter prompting extends to any Java package you include into your application, which would at least make the task of including AWT controls or other non-visual features into your project a little easier.

Some code (that generated by design-time controls and that added by the development environment for internal WFC gubbins) is marked in grey and must not be altered. At first, I thought it might be better if this code were hidden away as it would be in VB, but then it occurred to me that it's still necessary sometimes to see the application code in its entirety, generated source and all. In standard C++ style, the source is colour-coded and the colour-coding can be user-defined if required.

Other nice touches: when typing a long C-style comment, the editor automatically prefixes every new line with an asterisk until the comment is closed, if you begin with '`/**`'. Parameter prompting extends to other Java keywords including `import` (very handy when trying to remember that obscure package name).

A curiously-named Tasks window appears in the development environment along the bottom of the screen by default; this holds to-do notes that you make for yourself, but also contains all the compile-time error reports. Just like VB, VJ++ checks your syntax as you type, highlighting problems with wavy red underlining as in Word, and placing the error description at the top of the Task window. Although this mix of automatic and user-defined information confused me at first, I soon came to rely on it extensively for on-the-spot debugging.

The number of available toolbars seems to multiply with each release of Microsoft developer tools, and VJ++ 6.0 is no exception. As supplied there were fourteen, of which only one was enabled by default. The others pop up as and when they are needed. There are also a number of additional windows available on top of those shown by default, including a VB-style Object Browser, and two new Wizard-like dialogs, the Class Builder and the J/Direct Call Builder. The lat-

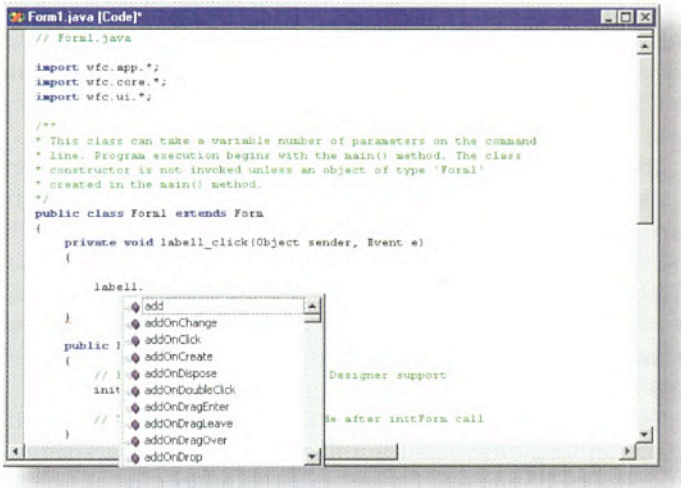


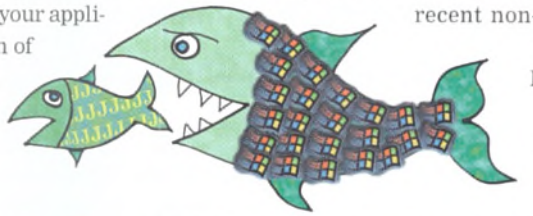
Figure 2 – VB-style method and parameter prompting is fully implemented in this version.

ter two allow the developer to visually select the classes or APIs he wishes to use or extend, and have the appropriate Java source code inserted at the current location. I found these two (especially the Class Builder) to be very useful and an obvious extension of the Visual SQL Builder and COM Builder incorporated into the current versions of Visual InterDev and Visual C++.

If your project is a Java applet to run in the context of an HTML page, you'll be glad to hear there's a full-featured HTML editor supplied as part of VJ++ (this is the same editor component that is in Visual InterDev 6.0, of course). This allows you to create HTML pages visually by dragging components from the Toolbox, including Dynamic HTML elements, and to write HTML code and client-side script by hand if you prefer. And yes, both HTML and client-side VB or JScript are method and parameter prompted.

The debugging environment for VJ++ 6.0 is on a par with that for both VB 5.0 and VC++ 5.0, and provides all the usual facilities; you can insert breakpoints, step into and over code, and restart execution. While debugging, your project runs (by default) within JPad, which presents your application to the operating system through the Microsoft VM as if it were a standalone executable. This means that anything you could do at runtime you can also do at debug time, without needing to patch the VM specially.

That said, the Microsoft VM has been patched to accommodate WFC and some of the other extensions introduced in VJ++ 6.0; it's worth bearing in mind that any end user of your application would need to have the latest version of the VM installed. Thankfully, the VM should be on the list of redistributable packages when the tool ships.



To my mind, this is the best Java development environment I have yet seen.

Wot, no JavaBeans?

This version of VJ++ has no support for many of the recent Sun-sponsored extensions to the language specification. It is possible to use JavaBeans in your VJ++ projects, but to do so requires the Bean to be wrapped as an ActiveX control, which again makes the code Win32-dependent. It was not possible to do this in the Technology Preview but it is mentioned in the help files and will apparently be a feature of the final product. JDBC support is limited to the JDBC-ODBC bridge which is part of Microsoft's Java SDK 2.0 and connects to ODBC data sources using the JDBC classes. It's also possible to connect to databases using the WFC data controls which are ODBC-native. There will be no support for JDK 1.2 elements (including the *Swing* Set) because, under the lawsuit with Sun, Microsoft has been denied access to any of the source code for these latest technologies.

The documentation for this release has moved out of the Developer Studio standard InfoViewer and into a standalone HTML help facility (see Figure 3). Documentation was included for both the Java SDK and Visual J++ 6.0 itself, although many parts of the Visual J++ help simply said 'under construction'. My general sense of the new help viewer was that it functioned as well as the InfoViewer but without the need to define complicated subsets and seemed to be faster and more responsive as well.

The sample code in this release was limited to three small applications, all designed to showcase a different Windows integration feature. I was rather impressed by one, which is a utility to tweak usually hidden aspects of the Windows desktop and which runs as a taskbar application. Although the code itself is relatively simple, creating

Figure 3 – The new Help viewer looks a lot like IE 4.0. Hardly surprising... it is.

such an application in Java with VJ++ 1.1 would have been difficult (and quite likely impossible). I expect both the documentation and sample code to be greatly expanded in the release version.

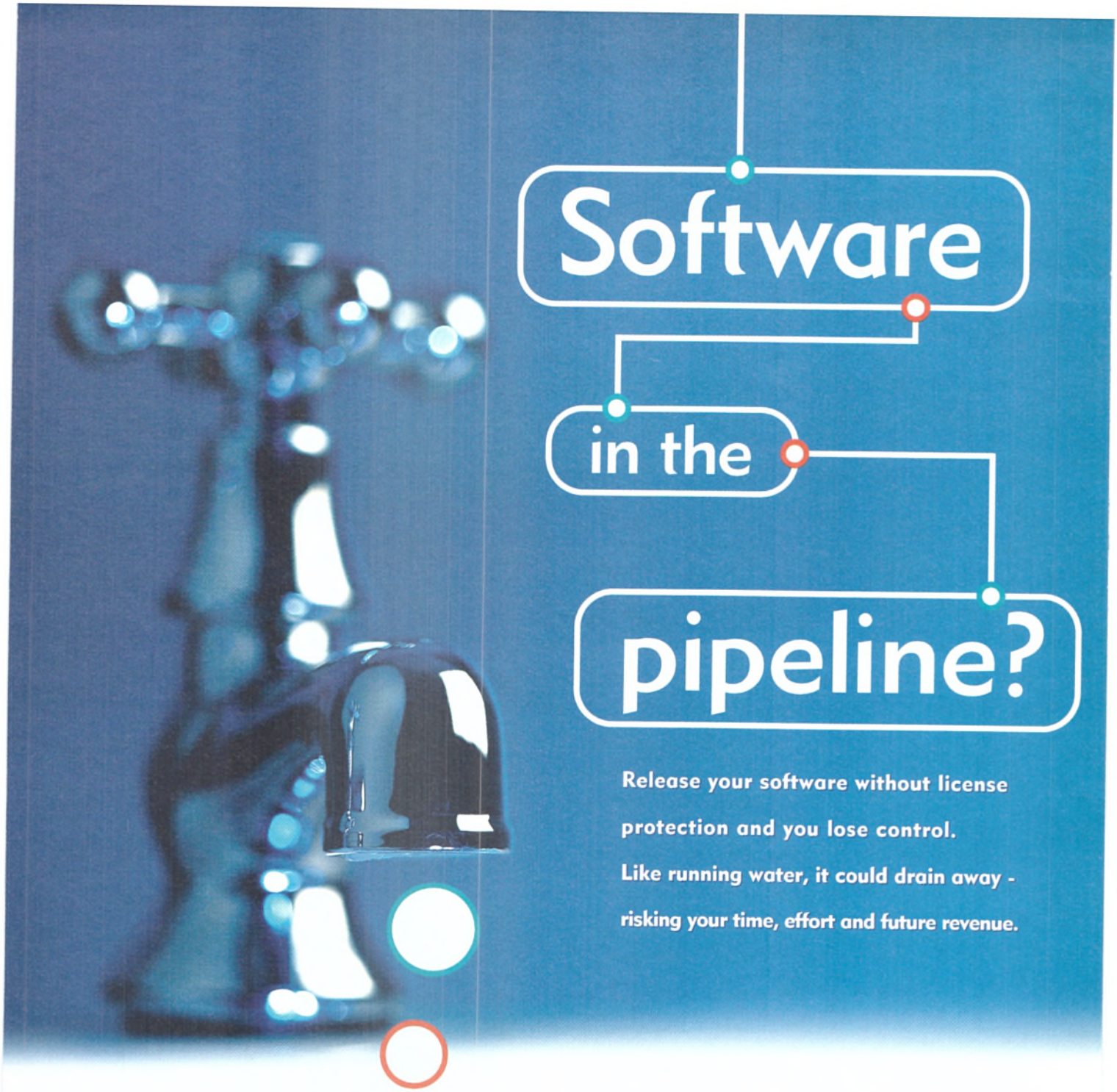
And the winner is...

This product has me deeply torn. On the one hand, I firmly believe that developers should have the choice of writing Sun-style '100% pure Java' cross-platform applications to the standard of the most recent non-beta JDK. On the other, I am thoroughly impressed by most of the improvements that Microsoft has made to the product.

To my mind, this is the best Java development environment I have yet seen. Even better, it promises to be the best C++ and Basic development environment I have yet seen. And it certainly is the best HTML/ASP development environment I have seen. With the extent of integration between the Visual Studio 98 tools, a developer armed with all of them should be capable of doing pretty much anything on the Windows platform that can be done. There are a host of productivity enhancements and time-savers which I only wish some of the other compiler vendors could copy better. Anyone with existing programming experience in a Microsoft environment and a couple of books on Java can be cranking out useful code in no time.

This is also the product's biggest failing. It is quite clearly designed for Windows, Windows and nothing but Windows. Microsoft has made no compromises to anyone who wants to use it for cross-platform development. It's possible, in the same way that it's possible to write machine code by hand without an assembler, but who'd want to do it? By eschewing support for common Java standards, or including it only as an option to convert to a Windows standard (like the JDBC-ODBC bridge, or the JavaBeans-as-ActiveX support) Microsoft has most definitely come down from the fence.

It's a little too early to say anything definitive on VJ++ 6.0 at this time – that will have to wait for a gold code release later this year – but if early indications are anything to go by, my recommendation is this: if you are at all interested in developing Windows-only applications in Java, download or order this beta on CD and check it out. If on the other hand you're dedicated to producing write-once run-anywhere 100% pure Java code direct to the Sun specifications, forget Microsoft and go compare the products from Borland, Symantec, and IBM. ■



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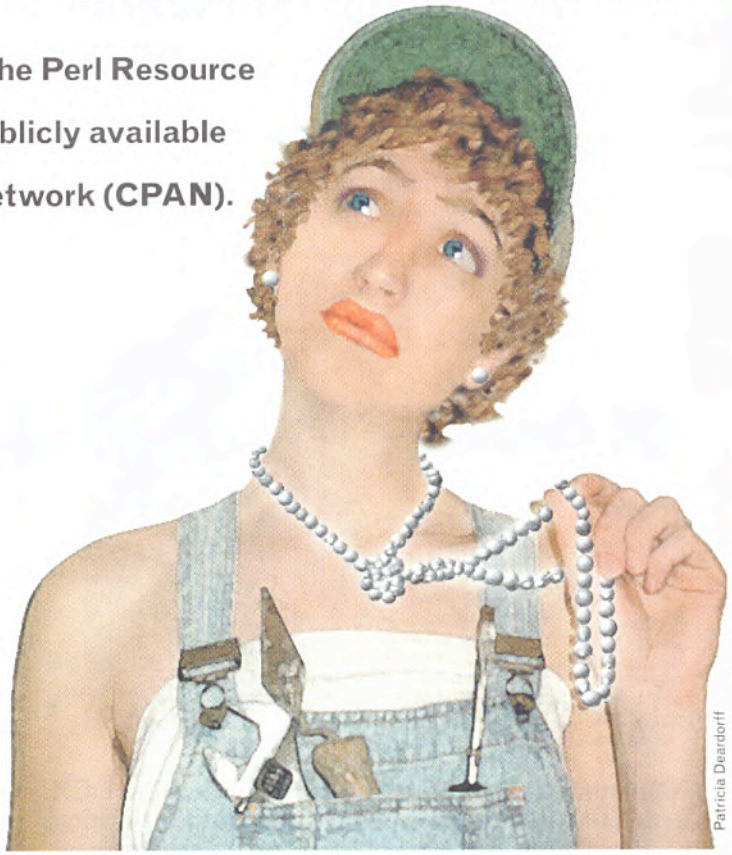
A Perl of a resource kit?

Peter Collinson renews his acquaintance with the Perl Resource Kit and shows how it provides a way into the publicly available software in the Comprehensive Perl Archive Network (CPAN).



Patricia Deardorff

I started to use Perl in anger in the spring of 1997. I had only dabbled with the language before that. I was just about to embark on several CGI scripting projects and felt that Perl was the language of choice for that particular application. Some of my early learning curve experiences were imparted to you, the patient EXE reader, in a pair of articles *Enough Perl to get by* published last autumn (EXE, September and October 1997).

And in the autumn of last year, a large box containing the Perl Resource Kit (PRK) arrived in my office from O'Reilly & Associates. Actually, it had sat there looking unloved ever since. I had undressed the box, and fondled its contents a little, but a meaningful relationship hadn't developed. The reason for this is simple, as I said in my autumn articles, I haven't felt confident enough with Perl to want to pick up and use other people's code. I think that I am now getting to the point where I can start worrying about writing good Perl rather than 'just any old Perl as long as it works'. I decided to renew my acquaintance with the contents of the Perl Resource Kit.

The life of O'Reilly

I have a great many O'Reilly books on my shelves, and they don't sit there gathering dust. They are used on a day-to-day basis. The company started by producing very competent books on Unix, filling a hole in the market formed by the lack of explanatory material on the system and its tools. The books are mostly well written technical guides, authored by experts in a particular field (such books are often ephemera, updated in a short time period as the topic develops). O'Reilly has also developed interesting binding techniques; several books are bound with a 'lay flat' binding. You can place them on the desk without using an elbow or a precariously balanced coffee cup to keep the book open at just the right place. This is simply brilliant. You're consulting a book and are able to have both hands occupied with typing.

O'Reilly was often there at just the right time, and as the Internet sprang into prominence it filled the various holes in the documentation on web and networking issues. O'Reilly is a strong supporter of free or publicly available software, undoubtedly because such software is often poorly documented, and there's a book to be written and sold. It has always supported Perl, and has printed the definitive texts on the language (see *Where to get things*). In fact, O'Reilly employed Larry Wall, the father of Perl, for a period in the summer of 1997. The result of this experience is available in the PRK.

The PRK box contains four books, an edition of the Perl Journal, and a CD. As is often the case with a package like this, you need to find the book which contains the friendly 'New Users Start Here' instructions. The first book, *Perl Utilities Guide* by Brian Jepson, is the place to begin. Part of the book describes what's on the CD, there is a big chunk on JPL (which is a way of embedding Perl into Java), and some reprinted articles from the Perl Journal. The articles are interesting reading for Perl hackers and I spent some time consuming them.

The remaining three books discuss Perl modules, which is the way that Perl code is distributed and used. Introductory material on modules is in *Programming with Perl Modules* by Nate Patwardhan with Clay Irving. The book explains the basis of the distribution system, and supplies many examples of how to use modules in your programs. The remaining two books document the modules. They are *Perl Module Reference*, volumes 1 and 2, by Ellen Siever and David Futato. These two tomes amount to 1195 pages.

Well, O'Reilly hasn't had to work hard to pull together information, from disparate sources all over the Internet, to create these books and the CD. The Perl community is already well organised and has generated CPAN, the Comprehensive Perl Archive Network. CPAN was modelled after the archive which was generated for TeX, Knuth's typesetting program. The CPAN archive contains many Perl modules supplied by different authors, stored either by module name, the author's name, or by the module category. Jarkko Hietaniemi in Finland runs the CPAN master site, but there are over 100 mirror sites all over the world. If you point your web browser at Tom Christiansen's URL, *http://www.perl.com/CPAN*, you'll find yourself on a page where you can choose a mirror site nearest you (there are three in the UK).

From packages to modules

CPAN depends on the module organisation that's provided by the Perl 5 release. Perl 5 has introduced a kind of lazy object-oriented feel to Perl programming. It is 'lazy' because it's more of a calling convention in the language rather than something which is dictated by Perl itself. This fits in with the Perl philosophy of never imposing anything on the programmer.

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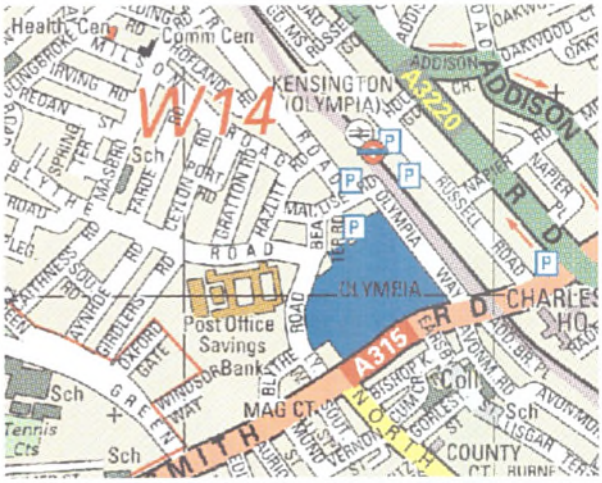

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Enquiry No. My33

Perl has always had the idea of a *package*. A package is a set of related routines contained in a (usually) single file. Well actually, it's more realistic to say that a package is a named symbol table holding the names in that package, and accessing the package name will access that symbol table. Of course, you want to call these routines (or perhaps access the variables global to the package, although this is deprecated by me) from other packages, and so you need to get access to that symbol table. You can refer to a routine or variable in a particular package by giving its full name: the package name, a couple of colons, and the name of the routine or variable which you want to access. If the package is called `Package` and the routine you are calling is named `routine` then you can execute the routine by saying:

```
use Package;
$value = Package::routine($arg);
```

This is long winded and tedious. Perl provides a complex way of exporting names from a package (which I won't go into) with the result that the creator of the package can say 'Okay I want you to be able to use my `routine`'. The caller can then say:

```
use Package;
$value = routine($arg);
```

However, the caller can still access 'internal' unexported routines and variables by giving the full path to the name in the appropriate symbol table. This mechanism provides a notion of inheritance because it is possible to import a symbol table from another package, effectively adding the routines in that package to the local name space.

Perl 5 has augmented these ideas. The changes start with the definition of a *module*. A module is simply a package which lives in a file whose name is the same as the package name. The file name has the suffix `.pm`, which tells Perl that it is dealing with a module. This convention allows Perl to map a package name in a `use` statement onto a file name.

Armed with a module, it's possible to define a class. A class is simply a module which implements class methods. The `new` method is a routine in the module which returns a reference to an instance of the class. This reference is then used to access methods within the class. Here we are defining a class:

```
Package Class;
sub new {
  my $class = shift;
  my $self = {};
  bless $self, $class;
  $self->initialise();
  return $self;
}
```

We call this constructor by:

```
$cl = new Class;
```

This may need some decoding. Perl passes arguments to routines as a list, and the first line of the `new` routine pulls the class name from the list and stashes it in a local variable (using `my`) called `$class`. The second line creates an empty associative array in the local variable `$self`. You can use the associative array to store any state that you need to keep with the instance of the class. The `bless` statement does the magic to register the class and it turns the values in the variables into references. An initialisation routine is then called to do whatever may be required, and finally the reference to the instance of the class is returned.

The construction of the class instance is actually nothing magic. The `new` statement acts like a routine call which works out where the code is to implement the class, and then calls the appropriate `new` method for that class. The code for the module is stored in a standard place in the Perl library tree, and there's a space that is not touched by the Perl installation process (the `lib/perl5/site_perl` directory) for you to put your own classes and packages.

Methods in the class are simply subroutines which know that they are methods:

```
sub method {
  my $self = shift;
  my $arg = shift;
  print "Arg is $arg\n";
}
```

This would be called by:

```
$cl->method("hello");
```

You'll see that the mechanism places the reference to the instance of the class as the first argument to the method, and although I don't use that here, you can access the values in the associative array should you wish to.

CPAN makes extensive use of this mechanism to allow you to download classes and modules containing routines into your own Perl setup. All that is needed to load a new function is to ensure that the namespace of modules remains unique and to place a file, which is the same name as the module, into the appropriate place in the local Perl library hierarchy. It's slightly more complex than that, because they've categorised the modules into different top-level sections. Often you want to create a logical set of functions which apply to some area but which consist of several distinct classes. For example, I have created a set of routines and classes which I've called `PCWEB` and you can pull them all in using:

```
use PCWEB;
```

The module name maps onto `lib/perl5/site_perl/PCWEB.pm` but it's more usual to use only one or two of the modules, and include them by:

```
use PCWEB::Macro;
```

This maps to `lib/perl5/site_perl/PCWEB/Macro.pm`.

CPAN also provides *bundles*, so that you can pull all the Perl modules, and their prerequisites, by loading the bundle.

CD content

The CD is mostly full of a snapshot of the CPAN archive (which seems to have been taken on 17 October 1997). It's a vanilla snapshot. Nothing has been done to the tree. It's a pity that it was necessary to compress the HTML and text files – you cannot point your web Browser at the CD and see the relevant files, in the same way that you can browse a CPAN site and see what is what.

The remainder of the CD is value added by O'Reilly. There's a large slab of Perl and Java code which permits you to embed Perl statements into Java and create a working program. As mentioned, this is called JPL and was created by Larry Wall. I'll fail to ignore the question about why you should want to embed Perl in Java in the first place. I suppose the obvious answer is that it allows the Perl programmer to avoid Java and to augment Java with the rich set of high level functions that are freely provided by Perl.

The CD contains a GUI setup program which can be used to extract and load code. The GUI is, of course, written in Perl and runs from the Perl binaries which are included on the CD. Binaries are supplied for Solaris 2.5 (or greater) on the Sparc and 2.0 Linux kernels on the Intel platform. If you don't have these platforms, you can pull the version of Perl from the CD and compile it.

The source for Perl is in the CPAN directory. My CD contains source for version 5.004, patch levels 1, 2, and 3. Usually on CPAN the file `latest.tar.gz` points to the most recent version of the source. However, on the CD it points at the patch level 1 version; don't be caught out. More confusing is that the binary version for Solaris is the most recent – it

is patch level 4. As you can see, there's evidence here of hurried replacement without considering the consequences, which means that things are not too consistent. I think that if you have net access, you'd do well to pull the most recent version of Perl from CPAN and install it.

Since I was running an older (patch level 1) version on my machine, I decided to take the opportunity to install the new binaries. I experienced big problems with the installation. The GUI gave up on me after installing several files, without being considerate enough to tell me what it was doing. To be fair, my Sun CD reader is dead, and I was pulling the files from my BSD/OS system's CD-ROM over the network. Mismatches somewhere were probably the cause of the problem. Anyway, I gave up, and pulled the latest version of Perl from my nearest CPAN and installed it.

CPAN has an initialisation file which is automatically created for you by filling in a form in the GUI, and this is a win. You can start things happening without a lot of grief. The setup program then allows you to load modules from the CD, and automatically install them. You can then pull a recent index from some CPAN site and update the modules to a recent version from the Internet. The GUI code piggybacks on the standard Perl module (called CPAN) which permits you to update your system automatically. I found that the whole system was deeply confused until I typed the command line interface:

```
$ perl -MCPAN -e shell
```

which took the contents of my initialisation file and proceeded to automatically install loads of recent modules with no complaint (and a little bit of human intervention to type in test values occasionally).

Things have now settled and I am able to choose modules from the CD and install them. I think that the GUI is in the class of 'could do better'. But without it (or without the documentation which comes with it) I would not have discovered that you can use Perl to install CPAN modules and update them automatically. Previously, I'd been pulling the odd module and installing it by hand (RTFM I admonish myself).

The printed page

Of course, the big win of the PRK package is the collection of printed information which it supplies. I must not give you the impression that CPAN modules are undocumented. CPAN modules have good release engineering and each source code file includes documentation. The text based markup used in the system is called 'Plain Old Documentation' and the tools which process it generally have some mention of POD in their name. There is a POD tool which converts the same documentation into the Unix `man` page format, so many aspects of Perl are documented in the manual pages on my Unix system. You can convert POD source to HTML, if you want to read your manuals with a browser. But the main win with the POD system is that the documentation should track the Perl code. A change in the Perl code can be reflected by a change in the POD text that's always in the same file.

However, although online documentation is fine for reference purposes, to my mind a printed copy in a book remains a good way to learn about something. This is especially true when the topic is disparate and contains several subjects in which I am only marginally interested. Having all the CPAN module documentation bound in two volumes on my desk is a win – I can flip through and find what's there.

As for *Programming with Perl Modules*, the book contains a wealth of illustrative material, with many worked examples showing how different modules can be used. Topics range from decoding arguments, copying files, handling mail, performing date computations, handling databases, graphical applications, accessing basic net servers like `whois`, dealing with internet news and, of course, the Web.

The two reference books, *Perl Module Reference* volumes 1 and 2, are organised in the same topic order that CPAN uses to store its information. This means that if you are looking for a particular name, say the CGI module, then you'll find it in volume 2 because it's in the 'World Wide Web, HTML, HTTP, CGI, and MIME' section. I did wonder about this choice. An alternative would have been to print the document in alphabetic module order. I decided that the decision was a wise one since it places related modules in the same section.

The books are produced as if the contents should have been one volume, as though it's been chopped down the middle to fit into two books. It would have been nice to see a complete table of contents in both editions, and a full index in volume 1. However, I'll guess that the books are at the limit of what you can safely bind with a card cover – there's probably good reason why extra pages were not added. The books are in quite a small font, so the words per page count is high, but I expect that adopting a larger font would have forced a three volume split, which was deemed undesirable.

(You must of course beware that things become out of date. For example, the released documentation for the CGI module has already diverged from the printed volume).

To buy or not to buy

The edition of the PRK which I have is firmly titled the 'Unix edition'. There's a version for Windows 32 coming along, and the O'Reilly product page gives its release date as July 1998. I am told that this means it will be available in August on this island. O'Reilly has subcontracted the technical work to ActiveState Tool, which was founded in 1997 by Dick Hardt and O'Reilly to create professional Perl development tools. They have Win32 downloads of Perl available on their website.

Perl is certainly one way of creating programs which should run on both Unix and Win 32 platforms, and I guess it is the way of providing Unix shell-like capabilities in the bare desert that is the Windows command line environment.

Would I buy it? Well yes, I think so. It provides a way into the publicly available software in CPAN that is hard to find if you haven't been there from the start and watched it grow. In addition, you are supplied with 30 days free support so it's possible to get some reassurance when things are not working as expected. ■

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Where to get things

You can get the PRK (ISBN 1-56592-370-7) from Amazon (*www.amazon.com*) on the net for $119.96. The list price from O'Reilly in the USA is $149.95. I talked to ITP who handle O'Reilly books in the UK, and the list price here is £109.95.

If you are after other books on Perl, the primary Perl book is *Programming Perl (2nd Edition)* by Larry Wall, Tom Christiansen, and Randal L. Schwartz. It's published by O'Reilly & Associates and is ISBN 1-56592-149-6. You might also like to see the book *Learning Perl* by Randal L. Schwartz and Tom Christiansen, again in a second edition and again from O'Reilly & Associates. Its ISBN is 1-56592-284-0. *Advanced Perl Programming* lifts the lid on some of the language's more abstruse parts. It's by Sriram Srinivasan, published by you know who, and is ISBN 1-56592-220-4.

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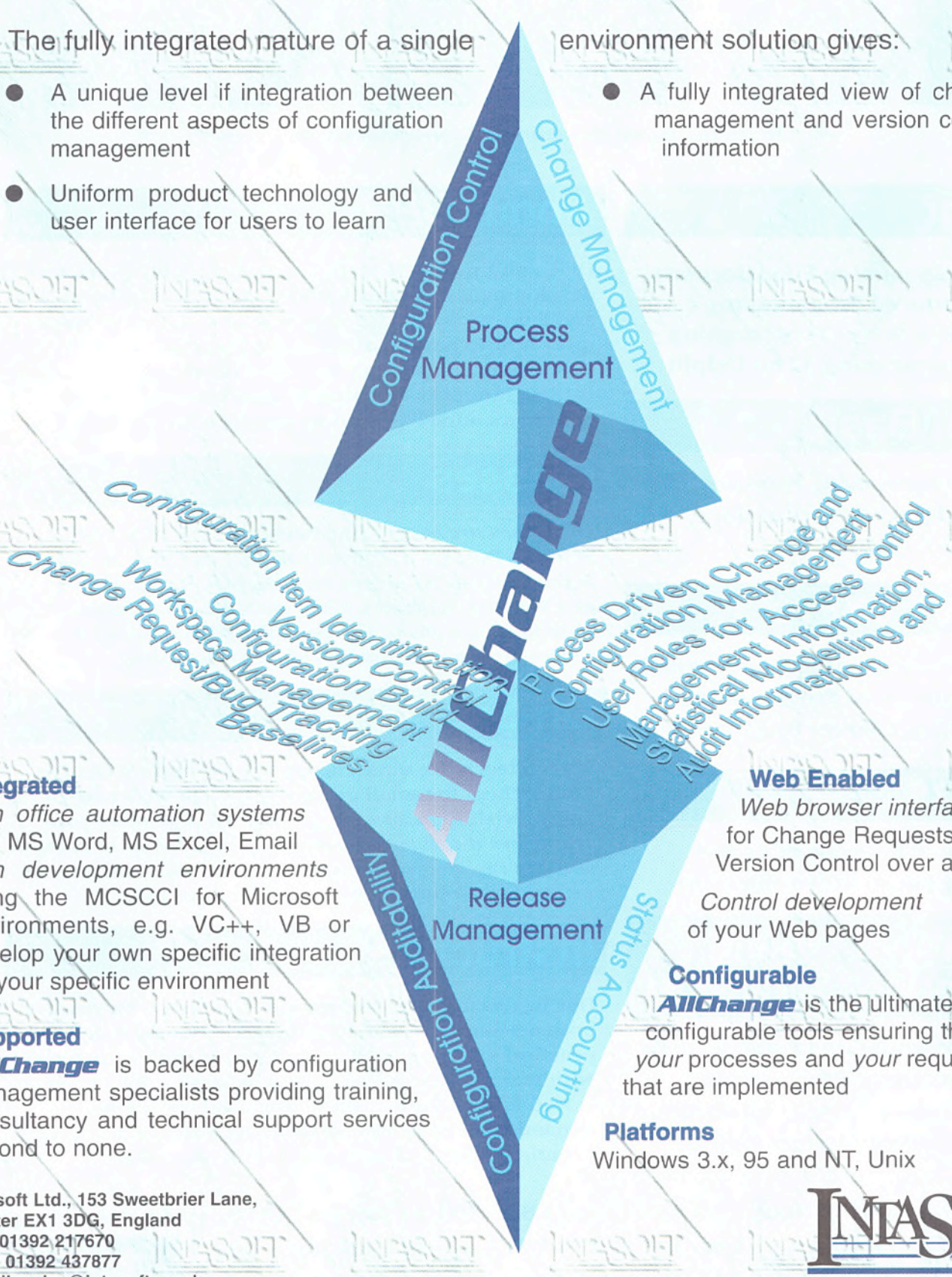

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JDK 1.2 – just in time

JDK 1.2 delivers a host of welcome features – Just-in-Time compilers, a Java STL, Extensions, and JavaBeans containment services. However, Tom Guinther detects a case of 'version aversion'.

If you don't know exactly which version of the Java JDK you're currently running then you are not alone. Many of the Java brethren, myself included, are in need of a little 'version' version control (not to mention lots more disk space) to help manage the different releases, updates, betas, and proliferation of extensions.

I don't want to give you the impression that I think all the versions and revisions are a bad thing. Of course not. Even though the number of new versions and revisions can be a bit overwhelming at times, they generally contain important bug fixes, performance tuning for tools and core packages, as well as new classes and packages and enhancements to existing classes.

Specifically for the advantages listed above, I am using the latest 'JDK 1.2 beta 3' for most of my Java development work. Then again, I am the classic early adopter who, for better or worse, tends to try out everything new or different. Along the same lines, I am using the official release of the Java Foundation Classes (JFC) version 1.01. This is a great library and includes the Java2D package, a Drag and Drop API, and *Swing*. If you are not familiar with *Swing*, trust me, it is not to be overlooked. *Swing* is a 100% pure Java implementation of a new set of GUI components with an architecture which supports the concept of a 'pluggable look and feel'. If you want more information on *Swing*, check out this column in the December '97 issue of EXE.

One of the best things about the JFC 1.01 release is that it is fully compatible with JDK 1.1: you can begin using it without any penalties (like upgrading your entire customer base to JDK 1.2).

What's new in 1.2?

Beyond the obvious, why will you want to upgrade to JDK 1.2 when it is released later this year? Well I can't answer that question for everyone since there may be any number of compelling reasons to take the leap to 1.2. However, one reason which should interest you is Sun's continuing (and successful) efforts to strengthen the core Java Platform.

For starters, JDK 1.2 will include Just-In-Time (JIT) compilers for both Solaris and Win32. This should boost performance for typical Java applications by four to five times, with results up by a factor of 10 in some cases. In case you missed the recent press release, Sun and Symantec announced that Sun has licensed version 3.0 of the Symantec JIT compiler for inclusion with future revisions of JDK 1.1, as well as JDK 1.2. I've had many positive experiences with the Symantec JIT, and feel that this was an obvious and beneficial choice for both parties (not to mention us, the end-users!).

Although adding a JIT is like strapping a jet engine to your Java applet or application, it can quickly reveal other limitations or bottlenecks within the system or platform. The engineers at Sun are well aware of this and are striving to improve the performance of the virtual machine, especially in the area of memory allocation and reclamation, and the overall process of garbage collection. The release notes specifically mention 'thread-local heap cache', and 'Garbage collection pauses are shorter'. My testing experiences with some *extremely cool* performance monitoring tools convince me that Sun (and other platform vendors) should take a serious look at its internal implementation of class `String`. When it comes to `String`, Java programs are *brutal*.

Java collections

While I mentioned JFC, which is part of the JDK 1.2 core platform, something which might also be considered a 'foundation' component is the new Java Collections API. This API is a unified framework for representing and manipulating a group of objects without knowledge of, or hindrance from, the underlying representation of the objects. That is, you can create and manipulate a collection of objects using one set of APIs whether those objects exist on the local heap, in a SQL database, or as a proprietary data structure on a remote computer. It allows the implementers to choose the best internal form for the implementation, such as an array, or list. If you are at all familiar with the C++ standard template library (STL), you will understand many of the concepts embodied in the Java Collections API.

On more than one occasion I have referred to STL as the 'Antichrist' so I was a bit anxious about the design of the Java Collections API. Once I saw the 'Design Goals' statement in the JDK 1.2 documentation, I was a bit relieved. The statement included the following quote: 'Our main design goal was to produce an API which was reasonably small, both in size, and (more importantly) in "conceptual weight". It was critical that the new functionality not seem alien to current Java programmers...'. I couldn't have said it better myself, but I haven't programmed with Collections extensively so I am still a bit wary.

Initially, the Java Collection API contained four core collection interfaces, but it has been expanded to include a total of six: `Collection`, `Set`, `List`, `Map`, `SortedSet`, and `SortedMap`. The basic implementation types provided are based on Hash Tables, Lists, Vectors, and Maps, with a variety of special permutations. And although it might go without saying, the Java Collections API provides a powerful set of iterators for traversing and manipulating objects and their collections.

Java Extensions Framework

Another major change (mostly conceptual) in the architecture for JDK 1.2 is the Java Extensions Framework. A Java Extension is a package, or group of packages, which implement an API. The extension, by both name and nature, is intended to provide a means of extending the Java platform without requiring the extension to be tightly coupled to the core platform. The Java Extension Framework is driven by the fact that the original Java platform had eight core packages, JDK 1.1 has 22, and 1.2 has over 50! Obviously, the platform needs to expand but without unnecessary bloat to the core components. The solution is to extend the virtual machine and the default class loader, to incorporate the concept of a Java Extension which can be referenced by applications and applets.

A Java Extension is a JAR file, and every JAR file is a potential extension. The deciding factors are the location of the JAR/Extension (an 'Installed' extension), or the way the JAR/Extension is referenced by another applet or application (a 'Download' extension). Installed extensions are stored in the *<java-home>\lib\ext* directory and are referenced and privileged much like the normal system classes of the core API. When an application or applet refers to a class, the virtual machine/class loader will first look among the system classes and if it cannot find the class it will automatically look among the installed extensions. Assuming the class is not part of an installed extension the VM will then search any download extensions referred to by the applet/application.

While anyone can define an API and create an extension, there will be many 'standard' extensions defined by Sun and third party vendors. For example, the Java Telephony API (JTAPI) is considered a standard extension, defined and implemented by Sun. Another vendor can provide an implementation of JTAPI which conforms to the published API. This might be a reasonable thing to do for a vendor specific platform, or a customised implementation which, while compatible, augments certain aspects of the API.

Although conceptually simple, and definitely a step in the right direction, there are certainly many tedious steps to creating a Java Extension. Most of the burden for installation, version consistency, and security policy is left to the Java Extensions implementers.

JavaBeans

JDK 1.2 will also contain major additions to the JavaBeans framework. The 'containment services', otherwise known by the code-name 'Glasgow', define the model for a JavaBeans hierarchy and a beans interface to its environment. The containment services are a direct correlation of Object, Linking, and Embedding (OLE). A browser, for example, might act as the container for a group of JavaBeans. The container provides a set of services, some standardised, which the bean can use to interact with its container or other beans in the container's hierarchy. The services provided can be dynamically determined which makes extensibility a relatively easy task. In general, the container can be serialized and the beans within the container can be serialized right along with it. One thing you will be happy to note is that the containment services interoperate with the Java Collection APIs discussed earlier.

Also of significance is the JavaBeans Activation Framework (JAF), which will be released as a standard extension to the Java platform. JAF is a mechanism for defining and registering data types and allowing other components to bind to those data types. In essence, JAF allows a JavaBean to define arbitrary data types that, while initially unknown to the consumer (a browser, for example), can be determined and transparently manipulated by the consumer. A good example is a `file` data type, which would support certain default actions such as `edit`, `view`, or `print`. Depending on the type of the file, it may provide other custom actions which can be queried at run-time. This is not unlike right-clicking on a file in the Explorer desktop and seeing the list of verbs (actions) available for that particular file type.

All in all, JavaBeans are a critical component of the Java platform and all the new features will help ensure the success of the JavaBeans architecture. I found the JAF specification to be a quite enjoyable read (for technical literature) while the 'Glasgow' specification is primarily obfuscated 'legalese'. Luckily, the document ends on a high note when it mentions that, because of the complexity of the protocol, a default implementation is provided. The default implementation can be sub-classed or delegated from a containing class. Regardless, if we had more documentation like the JAF specification we would all be a lot better off.

The final word on versioning

I want to go out the same way I came in, talking about versions and versioning. Yes, one of the new features of JDK 1.2 is a versioning API which allows a developer to dynamically determine what version of the Java Virtual Machine (JVM) is running, and what version of the Java Runtime is supported (see *Version information for the JVM*). And a standard mechanism is provided for versioning packages (see *Version information for packages*). ■

Tom Guinther is working for Vireo, a company developing device-driver tools. He can be reached via email at tomg@vireo.com.

Version information for the JVM

The version information for the Java Virtual Machine and the Java Runtime can be accessed through the existing method `java.lang.System.getProperties` (packages are handled differently), and each property is represented as a string.

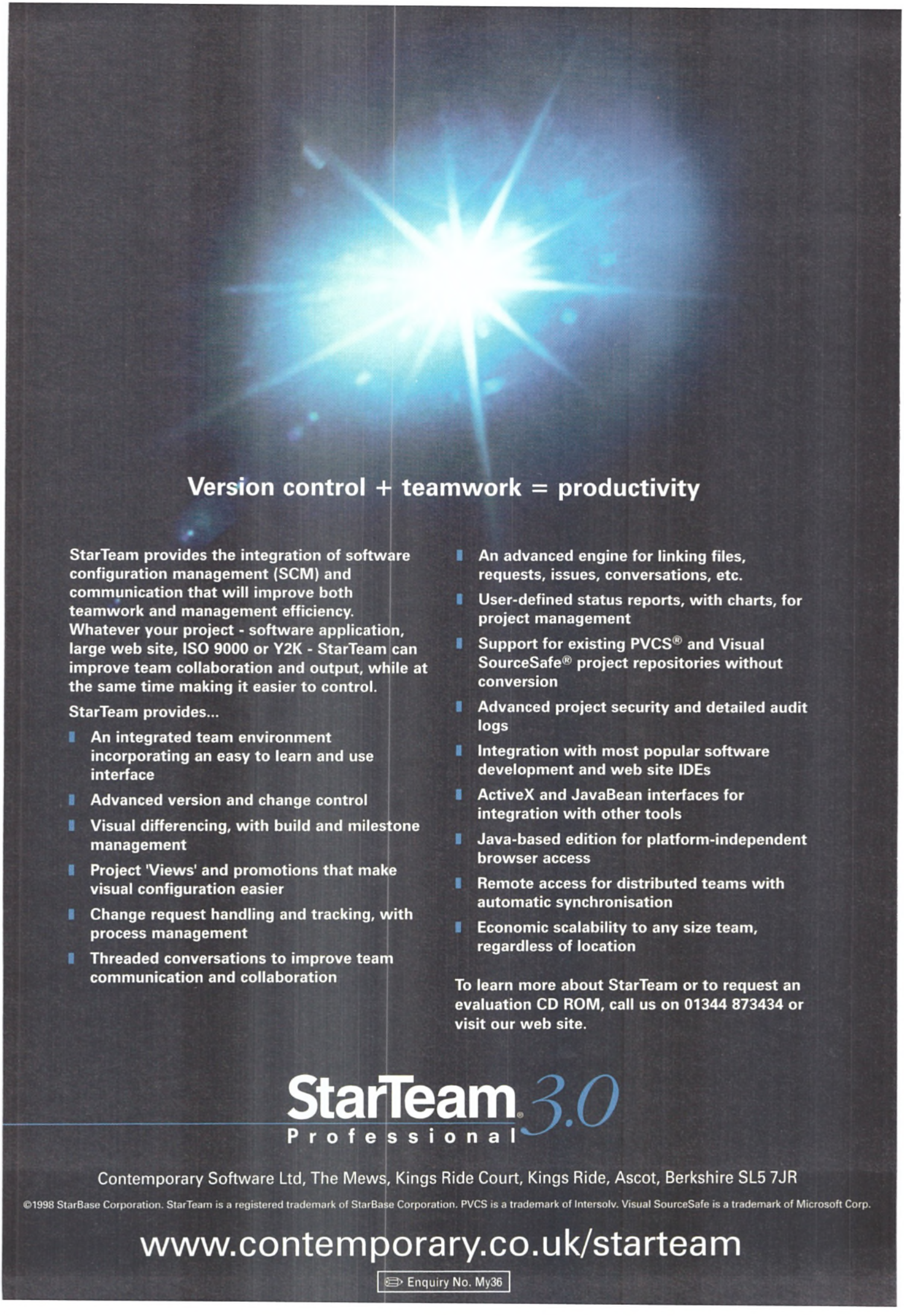
`java.vm.specification.version`	'1.2'
`java.vm.specification.vendor`	'Sun Microsystems Inc.'
`java.vm.specification.name`	'Java™ Virtual Machine Specification'
`java.vm.version`	'Solaris 5.5 Native 1.0 build32'
`java.vm.vendor`	'Sun Microsystems Inc.'
`java.vm.name`	'Solaris 5.x JVM'
`java.version`	'Solaris 1.2'
`java.vendor`	'Sun Microsystems Inc.'
`java.specification.version`	'1.1'
`java.specification.name`	'Java™ Language Specification'
`java.specification.vendor`	'Sun Microsystems Inc.'

Version information for packages

Versioning information for packages is obtained via the methods of `java.lang.package`, with the following version information supported:

Version Field	Description
Package-Title	Title of the package
Package-Version	Version number
Package-Vendor	Vendors company or organisation
Specification-Title	Title of the specification
Specification-Version	Version number
Specification-Vendor	Vendors company or organisation

Again, all the information is returned in string form.
The only catch with packages is that the version information has to be stored in the manifest of the JAR file which contains the package.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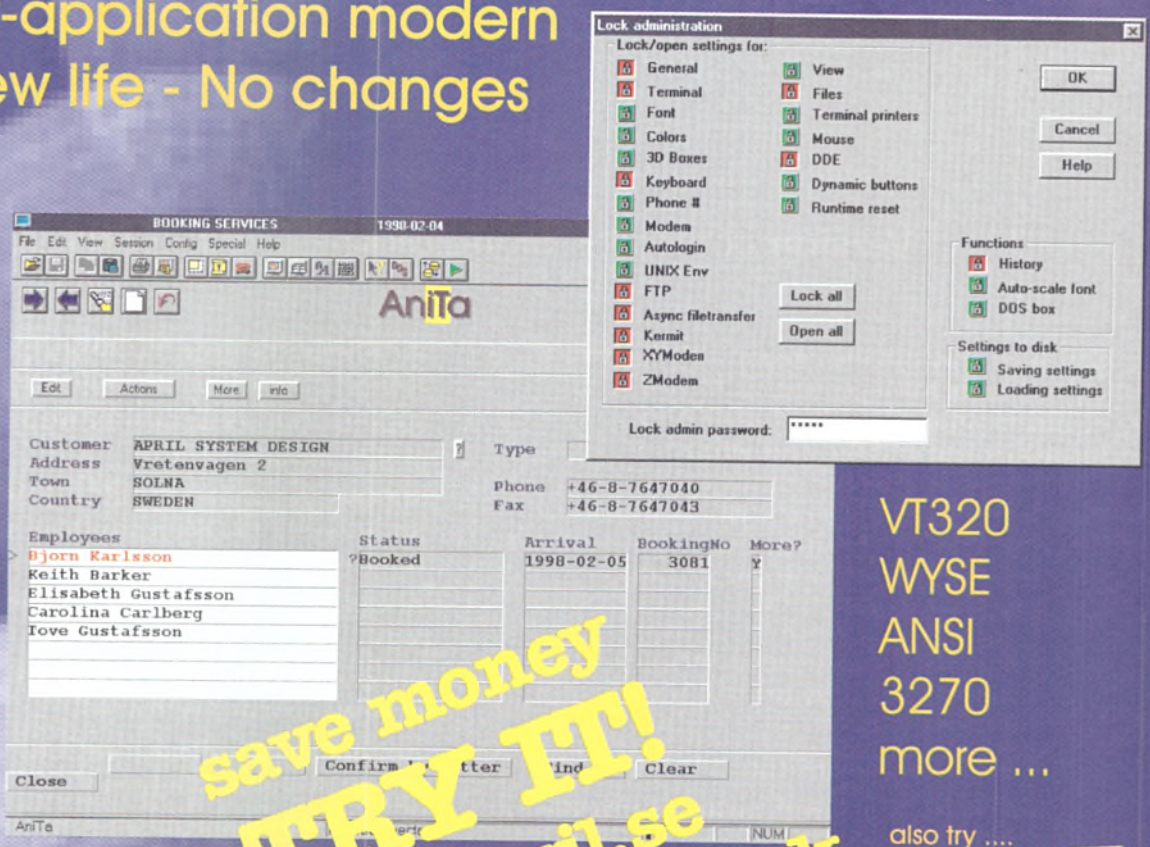

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Enquiry No. My37

A tip for the garbage collectors

Francis Glassborow asks 'Where do you want to work today?' and looks at Java's garbage collection, leaving memory management to the machine.

A few weeks back I had the pleasure of attending the excellent DevWeek conference at the London Business Design Centre. The line-up of speakers included such experts as Dan Saks and Scott Meyers, and these were kept fully occupied. Session scheduling left something to be desired. Any time you have to choose between Dan Saks and Scott Meyers is going to cause you grief. Putting outstanding pure C++ presentations alongside items on COM etc causes agony to those whose employers have sent them to improve their knowledge of the latter.

The unhappiest people were the exhibitors because with presentations of such high quality attendees had little time to talk with them.

With so many mediocre conferences on offer, the few good ones deserve all the support they can get (without it they disappear from your calendar). As I usually get a complimentary ticket to events which interest me, I do not feel too bad about abandoning a boring or poorly organised event at an early stage. However, just as I resent bad books because they take money away from the authors of good ones, I object to bad conferences because they reduce the attendance at good ones. I very nearly did not go to the above event because on paper it looked so much like the others. It was only because I knew several of the speakers that I decided to drag myself out of bed at the crack of dawn. I am glad that I did.

April issues

The recent meeting of WG21/J16 in Sophia Antipolis was much quieter than usual. We are waiting for ISO to process our FDIS (Final Draft International Standard) and so cannot even consider potential defect reports (we are realistic enough to know that we will get many of these to process at future meetings). This allowed us to enjoy the relaxed pace of life in Provence – three hours for Sunday lunch and four hours for an evening meal.

Bjarne Stroustrup enjoyed my APF for the April EXE and spent most of one day's meeting time doodling with code which one might write with an overloaded semicolon operator. It fired up his enthusiasm to write an article for *Overload* which includes such things as 'overloading missing whitespace' and colour significant identifiers, eg red (dangerous) for globals. Meanwhile, I passed round my copy of *The Journal of Object-Oriented Programming* so that those that had not seen it could read Andy Koenig's APF (brilliant, it had even caught out one of the regular WG21 members).

What do you read?

Obviously, if you are reading this you are not a typical developer. I can say this with confidence because I recently divided a guesstimate of the number of developers in the world by the monthly sales of publications for developers. The answer was substantially more than one. Most developers never read any periodical aimed at them.

Worse, most C/C++ programmers own less than two books on C++. Worst, most C++ books sold are technically inaccurate.

I stood in a Blackwells bookshop recently and asked a few customers why they had chosen the books they had. Some of the replies deeply disturb me.

'I always buy my books from this publisher because they publish well-written books at all levels of programming.' I had better not mention the publisher, but I know from fellow ACCU book reviewers that the books in question are riddled with typos and are frequently technically wrong, not once but many times per book.

'I saw lots of books by the author, so obviously he must know what he is writing about – otherwise the publishers would not publish his books.' That one is interesting because it suggests that sheer volume of writing will generate sales.

What language do you know?

I was talking to a recruitment agency recently and they asked me what the difference was between C++ and Visual C++. The question puzzled me a little, until I realised that Visual Basic and Basic are two very different languages. Despite the similarity in names, there are greater differences between VB and traditional Basic than between Delphi and Object Pascal.

If recruitment agencies think that Visual C++ is distinct from C++, that explains many things, not least the way that other compiler producers for C++ on Wintel platforms are suffering. If you understand C++, can write code for event-driven applications, and know about MFC, then you fulfil the criteria for being a VC++ programmer and will know how to fill in your CV next time.

Rather more frightening is the increasing tendency towards machine-selected short lists. Of course, we are far from having computers that actually understand your CV and letter of application. What they do is to apply a keyword count. If you want to be considered for the job, make sure your application contains all the required keywords. If you want to know what they are, just read the advert.

This kind of short list generation can result in bizarre choices. For exam-

ple, an advert listed six requirements. The applicant met five of them but lacked experience of Unix and said so. That meant that the keyword 'Unix' was in the application, and so he made the shortlist.

The battle of the keywords is hotting up. With the Internet being used to advertise jobs, the writers of adverts have to ensure that they include all the relevant keywords so that the job seeker's search engine will throw up the advert as a potential job.

Perhaps we will eventually manage to automate it completely and just have to ask our computer where we are working today.

Some thoughts on garbage collection

One of the major plus points in favour of Java is that it supports garbage collection (GC). We have known that from the first day we got our hands on a Java system. One of the major advantages of GC is that the programmer no longer has to track memory resources: the system will do it for them. I want you to think very carefully about that, particularly in the context of Java running on a multi-tasking system.

Java provides no mechanism that I know of for a programmer to force a Java applet or application to release resources. You do not believe me? Go and look at the multi-threading model and determine how you can force Java's GC thread to run to completion. The only way that I know is to close the application/applet down.

Now go and watch the average user of a browser. How often do they actually terminate an applet? Mostly the answer is 'never consciously, sometimes as a side effect of something else'. However, applets frequently get suspended. That process effectively leaks all the resources that the applet has not yet released. There is no way that your system is going to get those resources back for some other task.

Resources need to be managed. A multi-tasking OS with GC tasks running needs a mechanism to request that individual tasks release all non-essential resources. Without that, GC is an illusion. In other words, GC only pushes the responsibility for resource management up the hierarchy. It is perfectly possible to get your OS to manage resources in co-operation with GC tasks, but the tasks by themselves are actually counter-productive. We could require that any task does a complete GC pass before it goes into suspension, but even this mechanism might not work in the case of co-operating tasks using shared memory.

Please do not misunderstand me, I am not anti-GC. I just do not see it as a silver bullet to solve all resource management problems. Used by programmers who understand the limitations, it will do an excellent job, but one of the consequences of hype is that it brushes limitations under the carpet and inhibits understanding.

A well written C++ program using only well designed components (that eliminates most programs) will never be using more resources than it needs. Even the best-written Java program will almost certainly be hanging on to more resources than it is currently using. That is one of the costs of leaving memory management to the machine.

Last month's problem

Does it matter that

```
i;
```

is evaluated as an rvalue in C and an lvalue in C++? Of course, the answer is less obvious than you might think.

There are several places where C++ requires that expressions are evaluated to produce lvalues where C requires that they be evaluated as rvalues. The example above is the last of the changes of this kind and was introduced for subtle language requirements. Unfortunately, it does have some implications that just might bite you.

Writing such an expression as the above has a single conceivable purpose in C, forcing the reading of a memory location. In every other circumstance the compiler can optimise away the code as there are no other possible side effects. The only time that reading a location can have a side effect is if that very process itself does something else, such as clear a value from a memory-mapped input port. In such a case, the compiler needs to be warned against optimisation. In other words, the declaration of `i` will be qualified as `volatile`.

While this may still work in current releases of C++ (and will continue to work in C), it will not work in future because a statement consisting of just an identifier will no longer be evaluated for an rvalue. The significance of such a statement in C++ is that it constitutes a use of the object represented by the variable, and so the compiler cannot optimise away the constructor call that created it. This is particularly relevant if it is a copy constructor where the compiler has a rather broad licence to optimise. Of course, if the object is of built-in type or one that uses a compiler generated constructor, the compiler is still free to optimise away the constructor if the object is never used, other than in such trivial statements.

If you wish to restore C-style behaviour to legacy code, you will need to use a cast. For example:

```
Mytype volatile mvt;
mvt;
```

must be replaced by:

```
Mytype volatile mvt;
(Mytype) mvt;
```

This uses the fact that a cast is applied to a value (rvalue) and so casting an lvalue to its own type forces conversion to an rvalue. In this case, that means that the original storage must be accessed for reading.

Fortunately this change will have very little impact on real code, and vulnerable code can be located by grepping for 'volatile'.

This month's problem

Well-written code can be reused because silly errors by the user will be diagnosed. Unfortunately, many class designers miss subtleties with the result that their work is fragile. In this light, ask yourself what is wrong with the definition of the following value type:

```
class AddOnlyInteger{
   int i_;
public:
   AddOnlyInteger(int i=0);
   AddOnlyInteger & operator+= (AddOnlyInteger rhs);
   int getValue();
};
AddOnlyInteger operator+ (AddOnlyInteger, AddOnlyInteger);
```

In case you are wondering, you do not need to know anything about the implementation, which is why I have avoided providing the function bodies. ■

Association of C/C++ Users subscriptions: individual £15, student £7.50, corporate £80, Overload & C++ SIG £30 (including ACCU membership). For further information and application forms write to Francis Glassborow, 64 Southfield Road, Oxford, OX4 1PA, ring 01865 246490 or email francis@robinton.demon.co.uk. The C/C++/Java European Developers' Forum 1998: Oxford September 11th & 12th.

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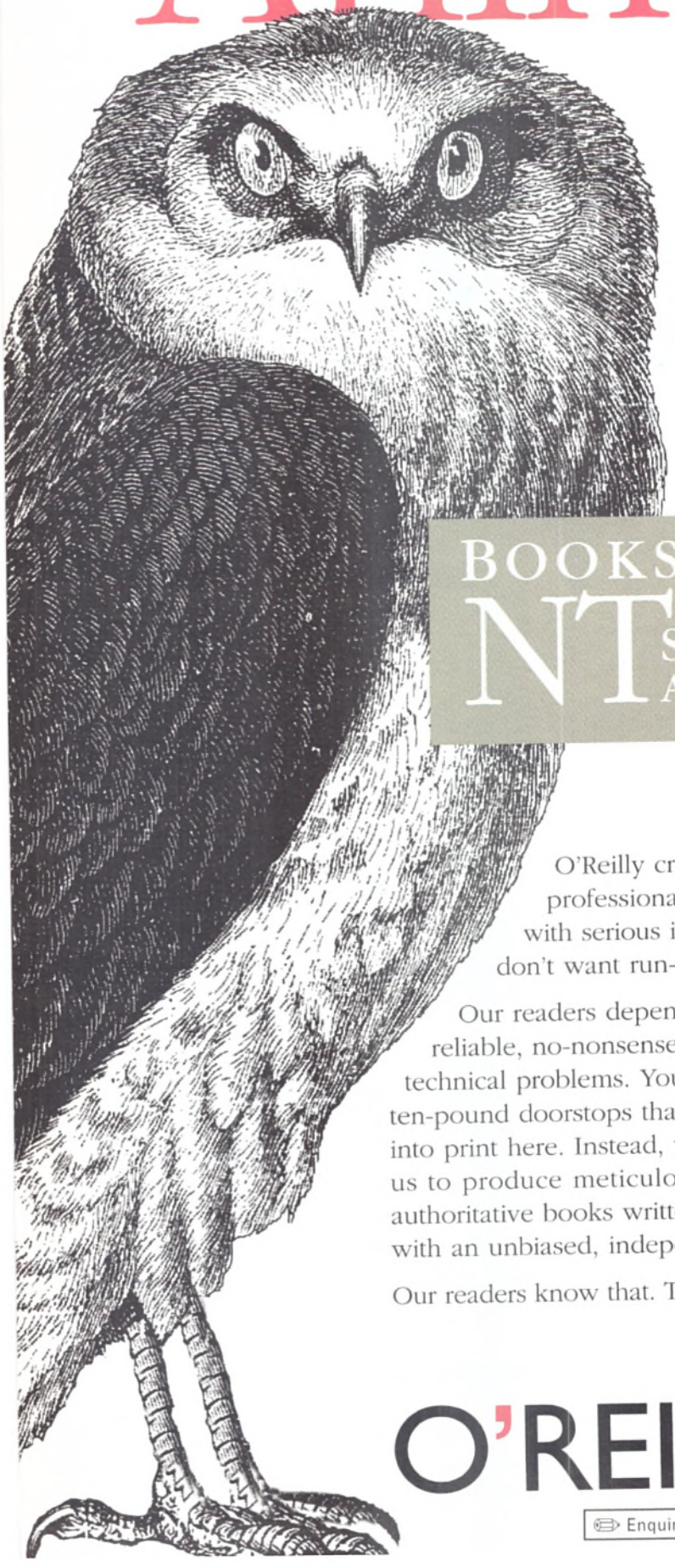

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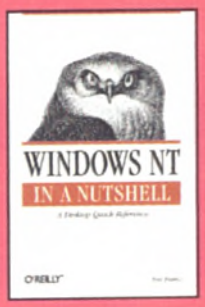

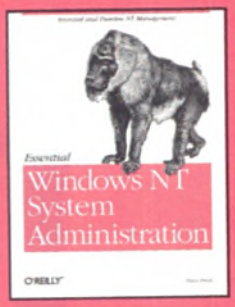

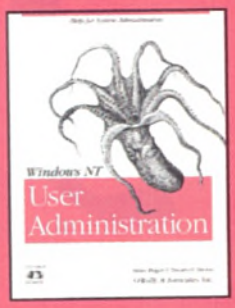

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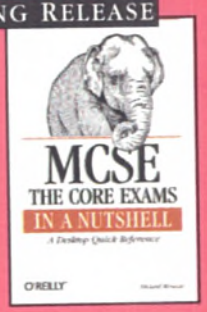
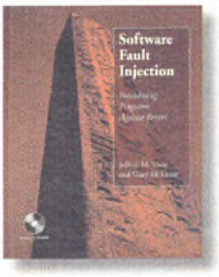


Software Fault Injection reviewed by Mark Harman



The idea of software fault injection is attractively simple and yet can prove highly revealing and effective in assessing the fault tolerant nature of a system. A number of interesting related concepts in software safety, measurement, analysis, and quality assurance, are also discussed in this book.

Software fault injection consists of deliberately inserting faults into software to assess how well it deals with these anomalous situations. This injection takes two forms. Firstly, injection of faults into the code itself (replacing a program with a 'mutant' version which, for example, contains a corrupted statement). Secondly, corruption of the program's state space (corrupting, for example, the value of a variable at some point in the program's execution). The idea is to see which faults the software can cope with.

Work began on fault injection as early as 1972 but the field has only really developed in the past 10 years. The earliest form of fault injection to receive wide interest was mutation testing. This is a technique where it is the code itself which is corrupted to create a 'mutant'. Mutants can be used to assess the quality of a set of test data. We all know how easy it is to define sets of pallid, cowardly test cases and the false sense of security which these comforting test sets gives us. By submitting our test sets to mutants we measure, not the original software, but the test set used to assess the software – testing the testers, as it were.

Injecting faults into the state space allows us to ask 'what if' questions which force us to think about the behaviour of our code when it finds itself in a state which we had not expected. Of course, we might choose 'easy' fault-injected state spaces too, so we have to use a tool to provide the anomalous states for us. The book explains these approaches in some detail, describing algorithms for fault injection and provides a CD (for Unix systems) containing two demonstration versions of fault injection tools (SafetyNet and Mothra).

Although the book is written as a sequel to *Software Assessment: Reliability, Safety, Testability* by Voas and Friedman, it can easily be read in isolation from this earlier book.

Software Fault Injection addresses an important problem in software development: 'how do we know how reliable our systems are?'. The book is well written with clear and simple examples, backed up by pseudo code from relevant 'real world' examples such as the Ariane 5 and Therac 25 disasters. The authors are experts in the field and their writing style is easy and uncluttered by unnecessary technical detail. Each topic is covered in detail, while the text is neither over-complicated nor patronising.

The final chapter gives the reader some tactics for selling fault injection approaches and technology to managers – perhaps, in addition to being well written, authoritative, and interesting, the book might find practical application.

✓ **Verdict:** Strongly recommended

Title:	*Software Fault Injection*
Author:	*Jeffrey Voas and Gary McGraw*
Publisher:	*Wiley, 1998*
ISBN:	*0-471-18381-4*
Price:	*£37.92*
Pages:	*353*

Java in a Nutshell, Deluxe Edition reviewed by Gavin Smyth

This is a package containing the book *Java in a Nutshell* along with the *Java Reference Library* CD, and five electronic books: *Java in a Nutshell*, *Exploring Java*, *Java Language Reference*, *Java AWT Reference*, and *Java Fundamental Classes Reference*. A rather surprising omission is *Java Examples in a Nutshell*, the companion volume to the second edition of *Java in a Nutshell*.

The texts on CD are supplied as HTML with accompanying JavaScript and Java applets, which means they should be viewable on most platforms. The Java code does provide a search facility but this only examines headings and does not give a full text search. Producing the material as HTML has let the publisher insert hyperlinks for cross-references. However, these are used only within each book individually and even then the job is not complete (for example, the reference sections have a lot of 'see also ...' pointers which have not been hyperlinked). It would have been nice to see the Java examples made more alive (ie as embedded applets, where appropriate). Instead the books just contain source code fragments and bitmaps of any applets, and they still have references to the O'Reilly web site for downloading complete source trees (though some of the *Nutshell* examples are on the CD).

Exploring Java starts with a gentle tutorial introduction to the language. This is followed by a more detailed and comprehensive examination of all aspects of Java apart from native code interfacing and the 'Enterprise APIs' (for example, database connectivity and remote methods). The bulk of the book covers the standard Java libraries and contains many clearly presented examples.

Java in a Nutshell is much more concise, though there are some tutorial and background chapters. The first edition of this book covered Java 1.0 and I found it irritating that this edition introduces Java 1.0 as before and then explains the changes in 1.1 instead of presenting the complete language as it currently stands. Once again, the Enterprise APIs are not covered. The main part of the book is a comprehensive, if terse, listing of all the features of the language (methods, classes, etc) with cross-references. This is a very useful section, though not particularly readable on paper – it may have been better for O'Reilly to supply *Exploring Java* as the hard copy instead of this book.

The other three books contain, as the titles indicate, much more in the nature of reference material, though they do start with some tutorial introductory sections.

As you might guess, there is considerable overlap between the books on the CD but, at less than half the price of the five books individually, this can be forgiven. The package is very good value for money and forms a comprehensive reference to the Java language. Although there is some tutorial material, I do not think this package is particularly appropriate for beginners.

✓ **Verdict:** Recommended

Title:	*Java in a Nutshell, Deluxe Edition*
Author:	*David Flanagan et al*
Publisher:	*O'Reilly, 1997*
ISBN:	*1-56592-304-9*
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Software by committee?

Rumours reach us that a new European Directive on Software Standards is to be implemented, laying down sweeping new rules to harmonise coding standards across the Union and to eradicate programming practices seen as un-European. Among its requirements are:

- To eliminate prejudice and encourage equality, all operators are to have equal precedence. Order of evaluation, if in dispute, is to be settled by plenary meeting of the European Court.
- Hungarian notation is to be replaced by Franco-Flemish notation which requires all variable names to be preceded by 'de la', 'van der' or 'aa'.
- A new variable type modifier, `shiftless`, will be introduced for integers which are not assigned a value until tomorrow.
- All variable names must contain at least one accented character.

(Apparently, the French contingent had wanted to make Eiffel the European Standard programming language, but under pressure from Britain and Germany a compromise was reached under which pointers are to be known as indicateurs and Bertrand Meyer is to be canonised.)

- Comments must be written in English, German, *and* French. Or Esperanto.

The final provision, introduced by the British delegation (which declared that it was 'tough on General Protection Faults, tough on the causes of General Protection Faults'), requires that all variable declarations, keywords, and statements be prefixed by the word 'new', except in the case of the keyword 'new' where this will be written as 'all new'.

The date for introduction of these provisions has been set as 1 January 1999, although we in the UK have an opt-out. Expect a referendum on the issue shortly.

Freebie of the month

This month's freebie comes from Centerline Software, who sent us this miniature life preserver, complete with a tasteful wooden box which we would be reusing were it not for its unfortunate connections to a certain ocean liner whose name we could not bring ourselves to mention here. If you know of anyone who this life preserver would actually fit and could give it a good home, please tell us. Otherwise it will have to be put down.

The future is here

We were recently invited to what was claimed to be 'A World First!', the presentation of the Genetix Universal Turing Machine. This was further claimed to be 'a fundamentally different approach to building software and the most important development in computing since the invention of the compiler'. Grandiose, isn't it? Well, as you can see from the screen capture of the opening screen, graphics are not yet supported (by the way the characters making up Genetix are flashing).

Genetix offers highly reusable code, called genes. To us it looks very much like a threaded interpretive language such as Forth...

Awards time again

This year's IBM OS/2 Warp Memorial Award for Shooting Yourself in the Foot goes to Microsoft's PR agency for inviting hordes of technology journalists to Bill Gates recent speech at Cambridge University and then putting us all behind the TV cameras where we could neither see or be seen.

The Sterling Software 'COOL:Spex' Award for Seriously Daft Product Names goes to Seiko for its recently announced 'RuPuter' wrist PC. We understand that advance orders from Melbourne are reaching stratospheric levels.

The Intel Pentium II Bunny People Award for Most Irritating Technology Product TV Commercial goes to... Intel. For those bloody Bunny People.

And the Reggie Perrin Grot Award for Pointless Innovation goes to Microsoft for the AutoPC, a Windows CE device which will be permanently installed in cars and tell you when you're going the wrong way. Ctrl-Break thought that was what mothers-in-law were for...

And finally...

It was confessed to us recently, by ever-enterprising Microsoft Developer Tools product manager Mike 'Mr MSDN' Pryke-Smith, that the small duck pond landscaped into the company's new campus at Thames Valley Park has yet to be named. We thought our readership could come up with something more original than Lake Bill. Suggestions on a postcard, please, to the usual address. The winner might even get some software from Microsoft. Although probably not.

Let's parler Y2K!

According to EXE Magazine's first ever press release from the Cabinet Office, the Prime Minister recently announced a 'new Year 2000 team'. It was silent as to which language he used to do it.

Notre chef merveilleux, M Blair: Bonjour, tout le monde!

Tout le monde: Bonjour, Tony!

Blair: Comme vous savez, le Royaume-Uni approche une catastrophe formidable. Une catastrophe qu'on n'a jamais vu avant. C'est a dire, une catastrophe catastrophique. Une catastrophe que se passerait à minuit au trente et un décembre mil neuf cent quatre-vingt dix-neuf.

T-le-m: Hein? Quand?

Blair: Sacré travail nouveau! Dix-neuf neufté-neuf! Deux mille moins un, pour l'amour de Cherie!

T-le-m: Ah oui, 1999.

Un wag: Vous parlez je crois du grand ouvert à Greenwich de la Dôme de M Mandelson?

Blair: Ha ha ho, très drôle. (Campbell: jetez-lui dehors.) Non, je parle de la bombe de l'an deux mille. Je parle du petit insecte du millenium.

T-le-m: Le petit insecte du millenium encore? Fan-sangé-tastique! Nous sommes thrillés, aux bord de nos chaises, nous ne croyons pas.

Blair: Jusqu'à maintenant, le gouvernement a concentré ses efforts de l'an deux mille sur des outfits énormes avec des hardwares anciens. Mais maintenant c'est le temps pour focusser sur le bloke et la mère travaillants en la rue. M & Mme Pentium 90 sans MMX. Imaginez la scène. C'est minuit moins vingt au trente et un décembre...

T-le-m: ...mil neuf cent quatre-vingt dix-neuf...

Blair: Oui, mil neuf cent quatre-vingt dix-neuf. Nous sommes chez l'homme qui, chaque soir, enjuice l'incubateur des petits chats à l'hôpital Rolf Harris des animaux.

Une hackette: Kittens? Ah! Les petits charmants!

Blair: Il essaie programmer son vidéo pour enregistrer l'édition spéciale nouveau millenium de *Les Amis*, mais qu'est-ce que c'est qui se passe? Le vidéo clock ne marche pas. Il est bien cassé. Alors, il faut que M Chat-husbander reste à la maison lui-meme pour commencer le vidéo.

La hackette: Et les petits chats dans l'incubateur?

Blair: Tous les chats, malheuresement ils donnent un coup de pied au seau.

La hackette: Les petits sont morts? Quelle horreur!

Blair: D'accord. Mais ne vous paniquez pas. Les petits chats seront hors de danger. Le governement a constructé un projet astucieux.

T-le-m: Hein? Quoi?

Blair: Un plan cunning. Nous avons l'intention de rassembler les yoofs qui fait le grand retuning des vidéos pour le commencement de Channel Cinq. Nous leur donnerons le quick-training de souffler les ROMs, puis nous les libérerons sur les Sonys de la nation.

T-le-m: Ingenieuse.

Blair: Mais ce n'est pas seulement les vidéos qui menacent nos petits chats. C'est les fridgidaires...

Mandelfils: La Grande Bretagne fraiche!

Blair: Tais toi, Mandy. Les fridges, les machines à laver, les hoovers, et les contraptions pour faire chaud un petit morceau de pain.

Un vieux journo: Comment exactment peut le petit insecte du millenium contaminer un toaster?

Blair: Un Russell-'obbes qu'on a acheté déjà en 1993, peut être il n'est pas compatible avec la crumpette du siècle vingt-et-unième. C'est une question très technique.

Un vieux journo: Merci beaucoup pour votre explanation lucide. (A son ami.) M Blair parle encore hors son orifice anterieur.

Blair: Naturellement, une campagne sans un slogan c'est comme un 2CV sans le sticker de CND.

(Il tire la corde d'un rideau et un hoarding immense apparaît.)

Le hoarding: Quelle temps fait-il? Il fait nearly the year 2000.

Blair: C'est joli, non? Merci tout le monde. Ne vous oubliez pas surfer à notre Ouebsite, l'adresse c'est ash tay tay pay deux-points oblique oblique double-vay double-vay double-vay point etc etc.

T-le-m: Zzzz.

Vocabulaire français de l'informatique

Un Ouebsite *– A Web site*

un développeur *– a developer*

un langage machine *– a computer language*

un programmeur *– a programmer*

une programmeuse *– a lady programmer*

un boot-up *– a boot up*

un weekend *– a weekend*

un shoot-out *– a shoot out*

un vidéo *– a video*

une petite ligne qui ressemble à un serpent *– a tilde*
(ok, actually it's 'tildé' in French too, we just felt this vocab needed a little more zip.)

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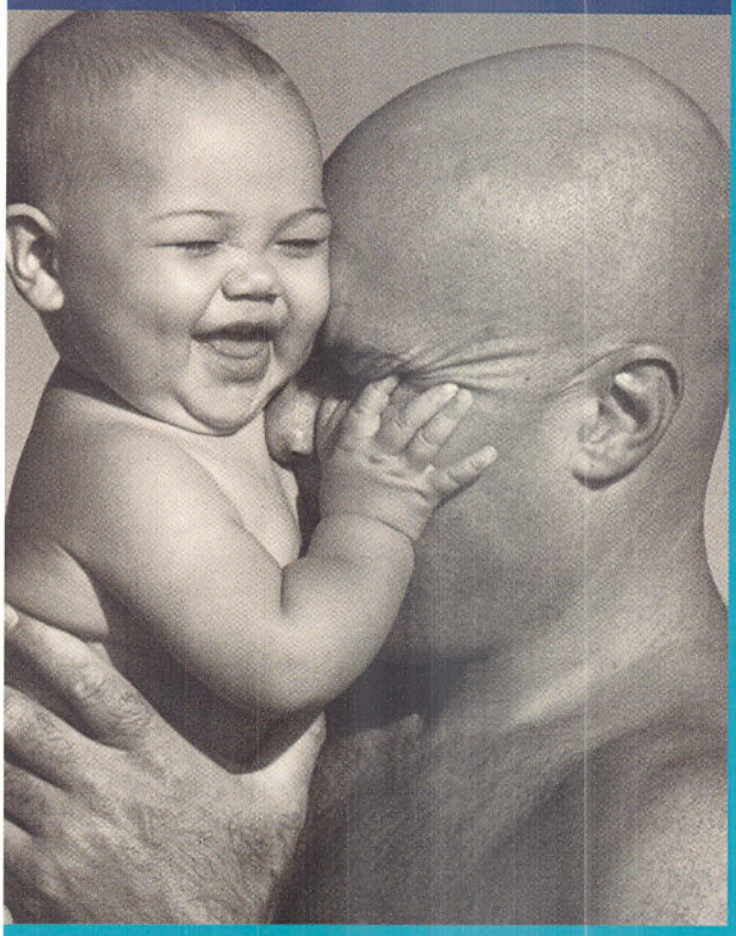

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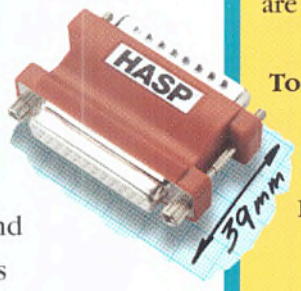

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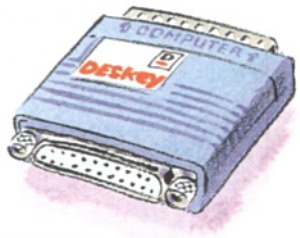

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