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C++ COMPILERS

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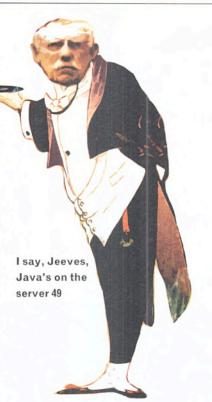
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User-definable markup for Web documents is on its way. Last November, the World Wide Web Consortium announced XML as a successor to HTML. Adrian Orlowski explains all.





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Format wars: what are they good for?



Twelve months ago I wrote about the impending attempts by an 'unholy trini-

ty' – Microsoft, Netscape and IBM – to take over the HTML standard by bombarding the W3C with new tags and syntax extensions at the same time as adding support for them in their browsers. My view at the time was that this would inevitably lead to the W3C having to 'rubber-stamp' and thus officially bless extensions which users had already got used to and would be loathe to give up.

This is largely what has happened, so I don't have to eat my columns in public. All joking aside, the unholy trinity – which rapidly became the dastardly duo as IBM dropped out of the tag-making business – has done little in the way of adding new tags to their respective browsers except for a few bells and whistles.

Even if the 'feature creep' which was so much a nuisance in late 1995 and throughout 1996 has slowed, there's a much bigger battle brewing in the Web world, and this time it's even more significant. Once again the primary players are Netscape and Microsoft, and the victim the W3C. For several months, both companies have been busy readying the next generation of their browser software. Leaving aside issues like the Webmetaphor desktop shell which is an operating system matter, the big area of concern for developers is so-called 'dynamic' HTML.

Dynamic HTML is a combination of an extended scripting model for the browser and a set

of tags allowing for HTML elements to be positioned at exact coordinates and in different zorder layers. Dynamic HTML pages are often complex JavaScript or VBScript programs which allow page content to be changed on the fly and a whole host of other 'cool' effects. Despite the flashy uses to which it has so far been put, this is undoubtedly the most significant client-side development in the Web programming field yet, and opens the road for properly programmable content. For precisely this reason it's vital that a single, unified standard emerges.

Instead, the situation is beginning to resemble that of the great format wars of the past - VHS/Beta, ST/Amiga, even Booch/Jacobsen/ Rumbaugh (although at least that one was solved amicably). Each company has its own implementation of dynamic HTML including proprietary browser object model and layering tag extensions. Each claims that this is the one true dynamic HTML. Each has submitted its proposal to W3C requesting inclusion in the HTML 4.0 standard. And of course, each is committed to not implementing the other's standard.

Every time there's been a format war in recent history one product or technology has triumphed at the expense of the other, but the winner is not always the most capable. Beta was technically superior to VHS, for example. And invariably the war leaves behind casualties – early adopters who bought into the wrong technology. You might think that Netscape would be bound to

succeed given the overwhelming strength of its market share, but think for a minute: not only will Microsoft be giving away Internet Explorer 4.0 free of charge, it will become part of the next release of both Windows 95 and NT as the standard shell. New users and upgraders will not need (or, I suspect, want to bother with) anything else. On the other hand, the legions of users on other platforms have little choice but go for Netscape if they want up-to-date features, and unless Microsoft's Mac and Unix teams get awesomely productive all of a sudden, that won't change.

In the end Microsoft is likely to pick up a big slice of Netscape's market share on Windows simply through incorporating the browser into the operating system. This puts Netscape in the unenviable position that it must either abandon the Windows platform and concentrate on areas where Microsoft is behind, or bite the

bullet and implement the Microsoft extensions. Doing neither – as it is now – is simply counter-productive.

Meanwhile, Microsoft's inflexible attitude to DHTML is making it even more unpopular with those who already had doubts about the company's commitment to open standards on the Web.

Last time I wrote about HTML, I made a few dire predictions, which are now coming true – albeit not quite as I thought they would. So let me make some more. Unless Netscape and Microsoft get their respective acts together, stop flaming each other on their Web pages, and come up with a single standard for dynamic HTML, Webmasters will simply not use either, and the technology will stagnate and probably die.

Whatever the outcome, it's unlikely to be good for the Web, or the developer. Let's hope that, for once, common sense will prevail. Neil Hewitt

A sense of community



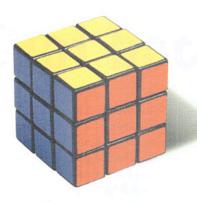
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information? No doubt EXE features high on your list. But after that? The Web, you probably have a few sites bookmarked, check some regularly and then jump from link to link. Newsgroups, mailing lists, IRC, closed conferencing systems... How much of all that

you read is really worth the time spent?

Remember the old days when you knew most of the email (if not the faces) of the posters, then the signal-to-noise ratio was better in the first place, and you knew near instantly which post to read. What we have lost is a sense of community. We desperately need some virtual community acting as filters on all the vast sum of information posted every second. David Mery

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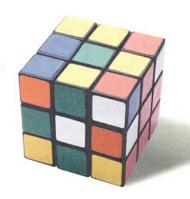


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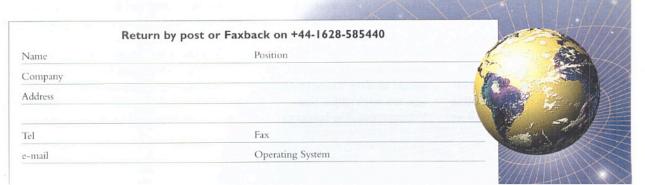
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Java is fast, secure...

Sun, IBM, Netscape and Novell joined together recently to announce the Java World Tour. According to the assembled panel, everything Java is going according to plan. The mood was one of full blown optimism: Java is perfect and we live in a wonderful world. When questioned about Microsoft and its AFC, Simon Phipps, Program Manager in the IBM Centre for Java Technology, and David Spenhoff, Director of Product Marketing at JavaSoft, both replied that the future Java Foundation Classes (JFC) will be the standard way to go and there is absolutely nothing to fear from Microsoft. They have no plans to work with them: 'The only person that is stopping Microsoft from being 100% Pure Java is Microsoft' said Simon Phipps. Sun and IBM stressed the fact that developers and customers are adopting Java because it is a cross-platform solution and since Microsoft's JVM is a Windows-only technology nobody will be interested in it (disregarding the fact that the desktop is owned by Windows).



Regarding speed of execution there was the same optimism, David Spenhoff commented: 'performance is not an issue or if it's an issue it will be improved'. For those who consider it a problem, some work is being done to improve JVM performance based on HotSpot from LongView Technology (recently acquired by Java-Soft). HotSpot is claimed to improve performance by a factor two over JITenhanced JVMs.

On the news side, in March Sun sent a formal application to the JTC 1 – the joint technical committee of both the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) – to become a Recognized Publicly Available Specification (PAS) submitter. If this is agreed, and it should be in July, then Java will become an ISO standard

but still under the main control of Sun. Time will tell what exactly this move means for the openness of the standard. Summer will see the incorporation of IDL as part of the JDK; this will ease the development of lightweight IIOP in Java. Novell will release its JNDI (The Java Naming & Directory Interface) in August. Also coming this summer is Enterprise Java Beans, an extension for transaction processing. And the IBM ActiveX to Java Bean conversion kit will ship with the Bean Development Kit. Of course by the time you read this the JFC Developer Release should be available on the JavaSoftWeb site.

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VB gets Assist

First there was Visual Basic. Then there was VBAssist from Sheridan. One of the early VBX pioneers, Sheridan's controls have plugged numerous gaps in the VB arsenal over the years. VBAssist 5.0 is the latest iteration of this control library, and comes equipped with a number of features specifically designed for the newly-released Visual Basic 5.0.

Among the added design-time controls are the Accelerator Assistant which automatically handles the initialisation and allocation of keyboard accelerators, Property Tips which pop up a user-defined list of control properties on demand, and Project Control Assistant which allows for project-to-source navigation via a single tree display. UK distributor Contemporary Software is on 01344 873434.

VBAssist 5.0 costs £130, with upgrades from version 4.0 at £60.

Java 24 hours a day

IBM has 1500 developers working in Java 24 hours a day. Okay, not all of them at the same time! Most Java applet development goes on round the world according to time zone differences. All specifications are done in the US, then coding moves to China, India and Russia, and testing is done back in Raleigh. In some places like China, coding is done in collaboration with Universities. Each project is staffed by about 300 developers and goes through a minimum of five sites where teams are composed on average of 20 to 50 persons.

According to John Slitz, VP Object Technology/Application Development, this kind of development 'works for application code, not system code'. (IBM did try multi-site development for OS/2 for several years but eventually regrouped all teams in Austin, Texas.) The size of applets developed in this manner is never more than 50 KB or approximately 100,000 lines of code. On system issues such as the JVM, all work is done in one place: Ottawa.

Asked about the commercial future of NetREXX, the scripting language developed by Mike Colishaw at the Hursley Labs, Siltz refused to commit himself. IBM is very interested in having one general scripting language working on all its software and hardware platforms but even though work is in progress no decision has been made as to which one will be chosen. What might appear this year is a UVM, or Universal Virtual Machine, capable of running code generated by Smalltalk, Java and Basic. Research and development of the UVM is done by IBM's subsidiary OTI in Ottawa.

Embedded development heaven for the Chorus ClassiX RTOS has arrived by way of the porting of Green Hills MULTI

Development Environment to the Chorus platform. MULTI incorporates C and C++ compilers and other standard embedded development utilities. 00 33 1 30 64 82 16

From Chorus itself comes version 4.0 of Chorus/Cool, the company's CORBA 2.0-compliant ORB for embedded devices. The big feature of this version is the embedded ORB profile which allows developers to install only as much or as little of the ORB software as needed for the particular task. 00 33 1 30 64 82 16

Oracle's Developer/2000 efforts continue with Developer/2000
Web Cartridge, which ports existing D/2000 applications to a Java-based Web delivery mechanism. According to Oracle, the use of Java rather than HTML will enable ported applications to enjoy an identical user interface across platforms.

www.oracle.com

The oddly-named SNiFF is a graphical development environment which claims to break down barriers between languages and development platforms by incorporating codeasbtraction and conversion tools. Supported languages include C++, Java and Fortran.

Latest entry into the growing Y2K automatic code scanning market is Legacy Systems
Workbench, which can scan multiple languages – including
Cobol, C/C++, and Visual Basic – for date-related defects at a claimed speed of 100000 lines per minute. 0171 328 0300.

Charts, charts and more charts

Sybase has released jConnect an all-Java JDBC implementation for Sybase servers and middleware. jConnect clients can be downloaded into a user's browser, removing the need for installation or upgrades. The developer license is free with deployment licenses priced by server.

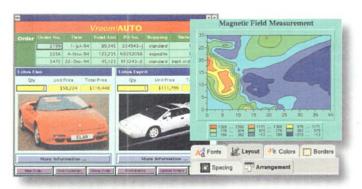
www.sybase.com

Also from Sybase are additions to its Replication Server family: Distribution Agent for MVS, Distribution Director, Replication Agent for IMS, and Replication Agent for VSAM. All are designed to work with Sybase's WarehouseNOW data warehousing system.

Borland's **Delphi 3.0** is available to buy in Standard and Client/Server editions. The final product incorporates all the features and add-ins covered in our recent review (see EXE, March 1997) plus Midas support. Prices start at £85 for Standard, £400 for Professional, and £1400 for Client/Server.

The shipping of Delphi 3.0 is the first step in Borland's product release schedule for 1997 and early 1998. Yet to come are the fabled J Builder (Latté of old) in Quarter 3, Intra Builder 2.0 in Quarter 4, and C++ Builder 2.0 in Q1 1998.

From WinSoft comes DBArtisan 3 for Oracle, a database administration tool for developers and end-users. DBArtisan features visual development (no SQL required), space management facilities, and an integrated scripting language. Price £999. 01628 418 122.



KL Group is shipping JClass Chart, a graphing Java Bean. The group's President Greg Kiessling claims that his company, specialising in GUI components, was the first ever to ship an extensible GUI toolkit back in 1989 (for Unix). Another claim is that its Windowsbased Olectra Chart 5.0 is up to '4 times faster than rival Bits Per Second's Graphics Server'. The company's current offering is composed of three product lines: Olectra for Windows, JClass for Java, and XRT for Motif.

IT Expo to stage database debate

This year's IT Expo show, to be held at the NEC in Birmingham between 24 and 26 June, will feature The Great Database Debate, a panel dicussion between luminaries including CA's Mark Sokol, IBM's Don Haderlee, Pat Helland from Microsoft and Ken Jacobs of Oracle. All have been involved in large-scale database products from their respective employers.

The format of the debate will be in true QuestionTime style, with the panel taking questions from the audience for discussion.

As in 1996, the show will consist of three smaller events: Database Expo 97, Software Development 97, and Systems 97. Networks 97 will be held at the same time.

Once again you'll find EXE at the show, so come along and see us. Blenheim Exhibitions is on 0181 742 2828. Olectra Chart 5.0 ActiveX reaches such speed only when using the Fast Drawing method which doesn't support redrawing but has other attractive features such as automatic axis scaling. When you zoom in or out of a graph the axis legends are automatically redrawn to be best suited to the current resolution, for example changing from a month scale to days or hours.

Three products make up the JClass family: a charting Bean, a table Bean (grid/table control like

a small spreadsheet) and BWT which enhances AWT. BWT provides today much of the functionality which will be part of the Java Foundation Classes. Each JClass component is shipping for both JDK 1.0.2 and JDK 1.1, and uses the same API.They work with most Java environments (SuperCede, MoJo, Visual J++, Visual Café...)

XRT is a series of Motif GUI widgets: 3D (dynamic 3D charts), field (data entry), gear (basic components such as outliner/tree, tooltips, tabs, progress bars, etc), graph (2D charting) and table (display and editing of tabular information). They're all included in the PDS suite.

All KL Group products are royalty-free. XRT/PDS costs £4100, Olectra Chart is at £175, JClass Chart and JClassTable each costs £275 just for the bytecode and £675 with source code, JClass BWT is £35 for the bytecode and £135 for the source. Tel 0031 20 6759 95 03.

w http://www.klg.com

Putting the Wind/U up Unix

Need to port Win32 applications to Unix? This is not an uncommon requirement in many companies where 'legacy' Unix systems abound but the programming talent has been brought up on a diet of Windows. Besides, who wants to write two versions of the software when you can get away with one? Bristol Technologies has long specialised in this particular thorny area with its Wind/U crossplatform development system, version 4.0 of which has just been released for various Unix variants.

As one of Microsoft's 'strategic partners', Bristol has been responsible for bringing technologies such as COM to the Unix platform – and on to VMS and even OS/390 – and this latest release adds support for a few extra Windows libraries including Winlnet, ActiveX, IE 3.0 Controls (with the ubiquitous CoolBar), and MFC 4.21 support. MFC 5.0 may take a while, however.

The company has plans to implement DCOM on Unix in the next release of Wind/U, although no-one was able to give a timeframe for this release. DCOM will be an increasingly important component of Windows applications as distributed systems become more popular, and having native support for DCOM on Unix will be important for Microsoft if it is to have greater success over the established Corba object model. This puts it up against other vendors such as Visigenic which is betting on the Corba/ActiveX bridge route and already has an impressive array of bundling agreements.

Wind/U 4.0 is available for SunOS, Solaris, HP-UX, Digital Unix/VMS, IBM AIX and SG IRIX systems. Prices range between \$10000-\$12000.

w http://www.bristol.com

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Help with Visual Basic from NuMega

QARun, the automated testing tool from CompuWare, has been enhanced to support

PowerBuilder applications built with versions 4 or 5 of the PowerSoft package. This adds on to the existing provision for Windows 95/NT, Unix, Macintosh and Oracle. 01753 774000

'End-to-end' client/server development tool company Aonix claims that it has become the first vendor to ship UML 1.0-compliant software in its Software through Pictures (StP) range. The sixmonth 'preview' copy is available free of charge from www.aonix.com.

Version 3.5 of Simware Salvo, the Web application development package, supports multiple scripting languages including JScript, VBScript, and Rexx. Also added is support for Microsoft's ISAPI server API to complement the existing provisions for Netscape's NSAPI.

For Smalltalk fans, ParcPlace-Digitalk has released Distributed Smalltalk 5.6 with Implicit Invocation Interface (I3) support avoiding the need for static IDL interfaces, Cryptic Object References for integration with various ORBs, and improved IIOP. Price from \$3850.

Embedded system developers working with Motorola's ColdFire MCF5206 controller will want to check out Software Development Systems' \$99 development kit preview. The kit comes with a sample controller and Ethernet card plus a 60-day trial of SDS's SingleStep Win32-hosted development suite. 00 1 630 368 0400

BoundChecker author Numega has recently announced FailSafe and CodeReview 4.0 for Visual Basic developers, two utilities which specialise in diagnosing and trapping errors in VB code - even after compilation with VB 5.0. FailSafe is an ehanced debugging system for VB, which promises to integrate debugging with performance analysis. The program keeps a detailed watch on all the stacks, function calls and memory accesses and displays information on the underlying execution of the program which the native VB debugger doesn't provide.

FailSafe 5.0 for Visual Basic will be forthcoming shortly. In addition to the features listed above this version will, we are told, include a redistributable component which traps and logs errors as they occur, building up a log for developer inspection, for example during a beta test programme.

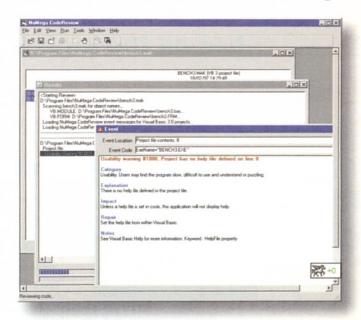
CodeReview is, apparently, like having a panel of VB experts inspecting your carefully-crafted code. The

Microsoft puts MSDN Library on line for free

Microsoft's has recently moved to extend the Microsoft Developer Network (MSDN) section of its Web site. The MSDN Library is a collection of technical information, white papers, documentation, sample code and online books which is supplied on CD with the quarterly MSDN update. However, the Library is added to much more frequently than four times a year, meaning that MSDN subscribers are often using out of date information.

To remedy this problem Microsoft has made the entire MSDN Library available on its Web site via the MSDN Online Membership. Access is not restricted to paid-up MSDN subscribers: anyone can join free of charge after filling in some online forms.

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



program is equipped with a database of various kinds of VB language, syntactic and stylistic errors, which it can detect and suggest corrections to. To do so, a copy of the Microsoft Knowledge Base for VB is included, which Code View references and uses to generate its advice.

Also announced and shipping is BoundsChecker 5.0 for Borland's C++ Builder. A version for Delphi 2.0 already exists.

For more information or distributor details, contact NuMega's new European office on 0118 925 3253.

w http://www.numega.com

IBM centers around the Net

As part of its campaign to emphasise the Internet as a business IBM has announced a slew of additions and improvements to its development tools range aimed at what the company has decided to term 'ebusiness'. Among the new versions of existing tools are Visual Age for Smalltalk 4.0, Visual Age Generator 2.2, and Visual Age for Cobol 2.0. All have been updated to take advantage of Internet component standards including ActiveX and Java Beans. Indeed, Java Beans will become the standard component model across all the Visual Age tools, emphasising IBM's already deep investment in Java technology.

Visual Age for Smalltalk 4.0 is pitched at building multi-tier client/server applications across multiple platforms (including, for the first time, MVS). Visual Age for Cobol has, unsurprisingly, been equipped with a multitude of features for solving the impending Year 2000 problems, with a focus on enhancing rather than re-writing existing code bases.

For Web developers, IBM and Lotus are delivering a number of packages aimed at corporate Web applications and industrial-strength Web sites, including Lotus Notes Designer for Domino and the amusingly-named Lotus Go Pro – which includes Lotus' Go Web server, version 2.0 of NetObjects Fusion HTML design package and Lotus Bean Machine for Java. The latter is a point-and-click Java Bean construction tool which, Lotus claims, involves no actual Java coding at all.

The final component in the line-up is Visual Age for e-business, which comprises Go Pro, Visual Age for Java, and probably some parts of the Taligent frameworks. For more details, visit IBM's Web site.

whttp://www.developer.ibm.com

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Object Factory 4.0 makes patterns in the GUI world

Developers working with IBM's PowerPC 493GCX embedded controllers will be glad to hear of Embedded System Products' port of its RTXC real-time OS. The system is claimed to have a true ANSI C/C++ compiler among its development tool components. 00 1 281 561 9990

Ever fancied building your own DOS? Well thanks to Caldera, you can. The company has released the kernel source code for OpenDOS (which started life as DR-DOS and became Novell DOS for a while) on the Web. Personal use is free, and commercial licenses are available. www.caldera.com

The new Visual Basic-like OVAL (Object-based Visual Application Language) for the Psion 3c and the Workabout with version 2 ROM is available. OVAL runs in Windows. A demonstration version is available on Psion's Web site.

www.software.psion.com/oval.html

SuperNova introduced
SuperNova/Visual Concepts.

This is a Corba-based communication architecture which can integrate PowerBuilder, Visual Basic, C++, Java and ActiveX components. Development and runtime are available for Windows, Unix, OS/2 and Motif. Price: from \$50,000 to £50,000.

www.supernova.com

Version 4.0 of the Eiffel programming language from Interactive Software Engineering sports a Windows look-and-feel, as opposed to the previous Unix-derived look. Other enhancements include a C++/Eiffel gateway for including C++ classes in Eiffel projects. 00 1 805 685 1006

Following the company's tradition of naming its tools after industrial workplaces, Rogue Wave's Object Factory 4.0 is a C++ GUI builder and source code generator along the lines of the JFactory product for Java. Unlike previous efforts, however, it is claimed that developers can control how the source code is generated through the use of customisable design patterns. This means that, for example, variable naming, declaration, and style conventions can be set up to meet corporate standards and avoid a lengthy - and tedious - reworking period.

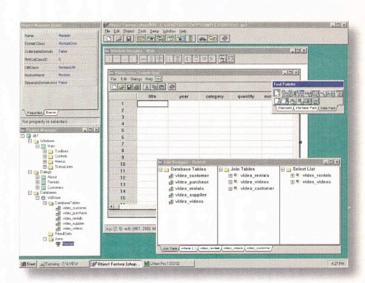
Database connectivity features figure high on the list of added capabilities, with the integration provided through the company's DBTools.h++ class libraries. Several visual database-manipulation tools have been added to the GUI builder including Database Object Designer, which allows for visual development of tables, views, joins and SQL queries. All the Rogue Wave custom interface controls

The Windows in the Willows

Building embedded applications, but wish you could use that old familiar Windows API? Well, according to Willows Software, you can. The company's Willows RT development kit is a tool that takes standard Windows API source code and re-compiles it for a variety of embedded hardware systems.

Porting an application is only one part of the process: consideration must be given to the final platform intended and its display and input/output capabilities. Willows aims the product at the NC market, providing Win32 API support as an additional string to the NC bow alongside the existing support for Java.

The company claims that Intel binary DLLs can be run on supported platforms, which even includes Macintosh and various flavours of Unix. For more information call 00 1 408 777 1820.



which are included have been made data-aware.

The libraries behind the code generation are from RogueWave's established zApp Developer Suite. Behind zApp and DBTools.h++ isTools.h++, a top-level set of class libraries which has been selling for some time.

A single-user license for Object Factory 4.0 costs £1195. The IDE is

available on Windows 95/NT, Solaris 2.5.1, and HP-UX. Native connectivity to Oracle, Sybase, Informix and MS SQL Server is provided in addition to ODBC. Code can be generated for any platform currently supported by Tools.h++, which at present means 32-bitWindows, Unix, and OS/2.

w http://www.roguewave.co.uk

Borland has the Midas touch

The latest product from the Borland stable is Midas, which the company describes as 'a set of advanced middleware technologies'. Although Midas is expected to extend throughout the company's product range including C++ Builder and J Builder – when the latter product is eventually released – the first tool to benefit is the newly-released Delphi 3.

Delphi has been client/server enabled since version 1.0, with enterprise-level client/server editions which included all the technologies, SDKs and drivers needed for traditional two-tier work, but until now three-tier client/server design using Delphi has been difficult and required the use of third-party middleware suite or application servers, with Microsoft'a VB 5.0 already transaction-server equipped, Borland has to do something.

Midas is a DCOM-based solution without any (as yet) support for other object models such as Corba, which seems to limit it to Windows-only networks, but since it will be tied to Borland's Windows products anyway, this may not be a serious problem. The Midas components include Business ObjectBroker which is a DCOM ORB, Remote DataBroker which is a traditional application data server, and ConstraintBroker, which promises to automatically apply server-stored business rules to Midas-built clients.

Scheduled to be available 'this quarter', Midas will apparently be bundled with the Delphi 3 client/server suite, with versions to be included in C++ Builder and J Builder at a later date. Deployment licenses cost from £3500 per server.

w http://www.borland.com

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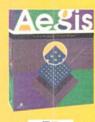


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Showing off

Jules wonders why computer conferences just don't rate beside car shows...

There's something wonderful about car shows. As soon as you walk into the hall, there's a sense of excitement, created by tiny dichroic spotlights playing on the flanks of shiny, glittery metal. Cars on stages look almost alive, hiding sleeping power behind their shampooed coats, just waiting for the tiniest tweak to burst into roaring energy. Car shows are cool.

The best part about car shows, though, is not the mainstream cars, the things the companies and trainers are trying to sell us. No, I make straight for the concept cars - the things that are taking up valuable exhibition space even though the manufacturers have no intention of selling us anything of the kind. Instead of being surrounded by salesmen, the concept cars are surrounded by engineers, who have been liberated from the workshops, brushed and washed by the PR guys, and dumped beside their creations. No matter that these engineers look like fish out of water; only they have the faintest chance of explaining (to the few people interested enough to ask) what it is they're exhibiting.

They're odd things, concept cars. Of course, the car companies have an 'ongoing programme of technical development' which is what gives rise to the vanishingly small changes in their mainstream models year by year. But the nature of this development is incremental, and just as programmers prefer new programming to legacy upgrades, the very talented engineers at car firms feel constrained by having to make everything they invent fit into old models. Most have a

fleet of vehicles whose sole purpose is to be chopped about in all kinds of horrific ways to test technology which is years away from production. But the concept car is not a development product in the same way. Instead, the design teams get together and build a one-off car, which has no chance of ever being produced, and they make everything different just for the sake of doing so. Instead of saying 'Is it possible to change what we've got and get a benefit?', they say 'Is it possible to do this differently, benefit or no?'

Why do companies exhibit their concepts? It's not to tell us what they will be building in the future, because these cars have no chance of ever being produced. It's not to show off the gadgets they will be adding to their mainstream products next year, because that kind of information is a closely guarded secret. It's not even to show the kind of technologies which may be brought to bear, because many of the technologies don't make it into production cars, ever. It occurred to me that it might be for the company to show its customers how clever and forward-looking it is. But then I realised; it's none of those things. It's so the company can find out for itself how clever and forward-looking it is.

What are the benefits of compound-curved windscreens? Put like that, not much. But on a concept car, you can use it as part of head-up display instruments, top-opening bubbles, and aerodynamic controls. You might be able to gain all-round visibility, at the expense of a lack of sunshades and rising cabin temperatures when the sun comes out.

The point is, for purely stylistic reasons, the incredible costs of developing mass-producable compound-curved glass could never be justified, but the costs might be justifiable if the other technologies are viable.

The concept cars go onto the stands not because the companies want customers to want them. They want the customers to play with them, and then see what bits they play with. That's why the engineers are manning the stand; it's because only engineers can look at the customers reactions and recognise them for what they are. Concept cars are market research.

What a contrast between this and the software business! In software we can do almost anything we want. But where are the concepts, where is the market research? Just like in cars, there are a small number of basic product types which make up the bulk of the marketplace, but there's no clear distinction between them any more. 'I have a small garage, and I have to drive through a crowded city' wails the driver, and the car companies respond with compact cars, and you can even get cars with the engine under the back seat. When the computer user complains of similar limitations, the software companies respond with 'Buy a bigger garage, and drive somewhere else. By the way, can we sell you a garage?'.

Modern software products represent a mix of (just barely) compatible features which suits some people but doesn't suit most. How many people, for example, program their word-processor? The vast majority who don't simply have to tolerate the fact that they may be

infected by macro viruses, because the programming can't be turned off, or bought separately. How many people would buy a wordprocessor with all the bells and whistles for 300 quid, if they could buy something simple and basic for 50?

At the shows, where are the concepts? They're all on sale, that's where! Where are the demonstrations of what kind of spreadsheets you could have if only you had 10 teraflops on your desk? Where are the demonstrations of what could happen if your mouse was controlled by your eyes? These things can't be sold yet, so nobody is even thinking about them.

It's odd, when you think about it. It's hard to think of an industry which is more hidebound, more 'keeping up with the Jones's' than the car industry, and yet here it is indulging in expensive flights of fancy to see what might be worth investigating. In contrast, the computer industry, which is supposed to be innovative (but is in fact, just as hidebound), does nothing but sell barely-possible technology without even knowing whether the buying public wants the products or not.

Of course, there's one other thing about the concept cars.
One of the best ways to get someone to want your product is to tell him that you're not prepared to sell it to him – exclusivity, it's called. I reckon our business could do with a little exclusivity.

They're noisy, dirty, and they poison our children. Jules doesn't care; he's a confirmed petrolhead. Call him on 01707 662698, or mail him on jules@cix.co.uk



Upgrading VC++ 4.2

Dear Sir.

If one hasn't already done so and is a Visual C++ version 4.2 user, one should upgrade to v4.2b. If one doesn't do this, all sorts of things go wrong in trying to create OLE / ActiveX controls. Of course, one could always upgrade to v5.

Seemingly no one had thought that it might be used to create ActiveX or OLE controls, and so had not bothered to see whether it works. It doesn't.

For those not upgrading to v5.0 and who can afford a few hours of telephone time, a patch is now available at http://www.microsoft.com/visualc. A word of warning – don't ignore the instructions as I did – follow them to the letter before running VC++ again. I didn't and had to reinstall v4.2 and run the patch a second time.

Happy patching

John Cant

johncant@in-net.inba.fr

Genetic algorithms

Dear Sir,

I read last months EXE articles on genetic algorithms with some interest, and subsequently downloaded Chris Kopec's thesis and had a good read through that too, before jumping in and writing an optimum Maze solver for myself. I'm making some progress but have had some baffling results on the way. The one which had me most confused was when I introduced mutations and some of my result sets got worse (using the same random number seed to ensure the same mating patterns)! My guess at the moment is that a particular gene sequence which may go on to provide the best solution is mutating first into a more mod-



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

erate solution which precludes the original, better solution. My next hurdle is the strong tendency of my populations towards homogeneity...

Have you considered the relationship between a genetic algorithm and the process of actually writing a piece of software? You start off with a requirements spec (fitness criteria) and introduce a sequence of events that you hope will solve the problem, namely lines of code (genes). Now, even the best programmers will find out that their initial design doesn't quite match the spec, so they start swapping lines of code (shuffle mutations) and introducing new lines of code (random mutation). The only differences are that the programmer has to concentrate on one gene sequence at a time rather than computing in parallel, and that the programmer starts off with a pretty good guess at the final solution (well, some do...) and introduces mutations in a less than random manner, although these last two components could be introduced into a genetic algorithm. Neil Waldie

iven vinne

NWaldie@compuserve.com

One last thing...

Dear Sir

I have just realised that my May column (p. 65) in which I discussed template default parameters contains a factually inaccurate statement. What the core working groups of the C++ Standards Committees never provided was default parameters for member templates. These are desirable for such things as constructors and as such had been used by the

Library working groups.

The problem with class default parameters has been that most compiler writers have not yet implemented them with the result that they have to be 'faked' in STL implementations.

I guess that the main results of my error will be to give some experts a good laugh, and some mail from those that know enough to spot it.

Francis Glassborow

Real Ale

Dear Sir.

I was glad to see that Jules maintains a healthy scepticism about Microsoft and all things Windows (EXE April '97), and I felt particular agreement with his comment about people still using DOS because Windows and Wizards prevent people from understanding what their computers are doing. I am one of those people (are we only a few?) and only use Windows of either flavour when I am compelled to do so because software I wish to use will not run any other way.

I remain unconvinced of the advantages of a graphical environment for many applications in practical business computing - much wordprocessing, databases, records and accounts though there are obviously application areas such as DTP where graphics are essential, and whole new areas of computing such as the Web of which images are an integral part. I sometimes wonder how much time and computing skill has been wasted, and disk space and memory consumed, by the wholesale conversion to Windows merely because it became the fashion. As for arguments about ease of use - when most of the icons on a hopelessly cluttered screen are completely incomprehensible without 'fly-by' text to explain what they mean, haven't we rather lost the point?

I sometimes have an uneasy feeling that if enough supporters of DOS and common-sense computing had spoken out more forcefully several years ago they might have been able to influence the PC software business in the same way as CAMRA were able to persuade the brewing industry to re-introduce Real Ale. Perhaps the truth is that we could never have succeeded at all because of the fact that PC software is dominated by one company in a way that the brewing industry is not.

To return to Jules' point about users wanting to understand – and I think he might have added control – what their computers are doing: when I needed to put Windows 95 on my system I wanted to retain full use of DRDOS 6 and Windows 3.1, so I used 0S/2's Boot Manager to install Windows 95 in a separate drive C partition and select between the two environments at startup.

This worked fine, but I still rather resented the way Windows 95 took away my control over how the system started up and closed down, so I was quite pleased to find out how to make Windows 95 start up into a DOS menu in the way I am used to.

Peter Moffatt
peter.moffatt@cali.co.uk

Don't you think there's a need for a multi-tasking DOS - something like the way Unix backgrounds, plus a limited kind of task switching. Just thinking... – Jules.

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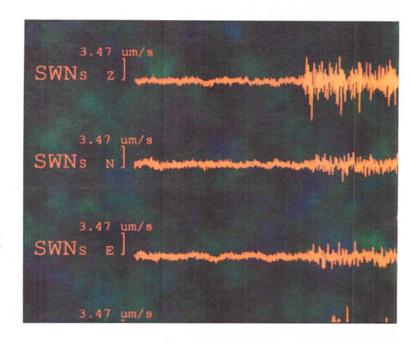
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Change Nothing Change Everything

Quake-C

The first tremors of game development



Edward Kenworthy shows you how to frag the guy without even being at the keyboard

Wolfenstein 3D was the game that started off the 3D phenomenon but it wasn't until Doom that any real effort was made to modify the basic game. However the only way to do that was by hacking the Doom program files using a hex editor or similar. With the advent of Quake, the boys at ID finally made life easier for the game hacking community, and allowed developers the control they'd been yearning for.

The Quake system comes in four parts. Firstly, quake.exe, the basic engine, which is not intended to be modified. A set of Quake console script files, which are effectively simple batch files to run console commands. There are two principle reasons for using these – firstly to setup the basic key bindings and secondly to enter characters that can't be input inside Quake. The third component is the various graphics and map files (held in a single pak file). Playing with these (to create new levels, for example) would warrant an article all to itself, so I shan't be dealing with it here. What I am concerned with is the fourth component: progs.dat, which is a semi-compiled script file describing pretty much everything that you recognise as being Quake the game. The script can be modified in Quake's own langauge, Quake-C, and it is here where the real power lies.

The basics

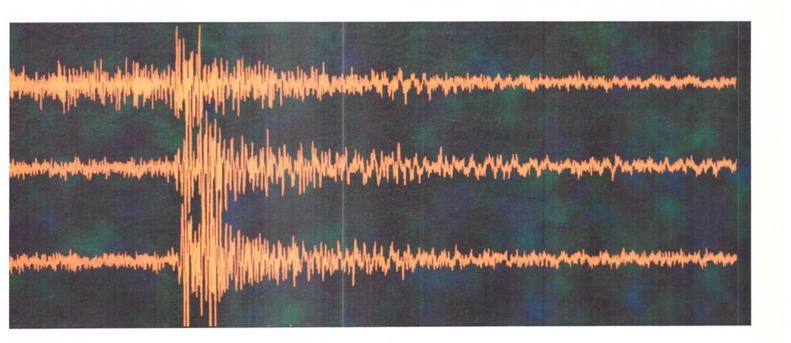
Before you can do anything with Quake programming – whether simple console scripts or a full blown Quake-C program – you need to understand Quake's directory structure.

Assuming Quake is installed in c:\quake then there is a sub-directory of this directory called id1 (c:\quake\id1). This is the place that Quake looks to by default for the various script files, configuration files, the pak file and the all important prog.dat file. Specifically you'll find autoexec.cfg – which is a console script file that is automatically run when Quake is run; config.cfg which is where all the previous settings and key bindings you've set inside Quake are 'remembered' and any other console script files you might have defined.

If you decide to modify any of these files then you should setup a separate sub-directory for them for example c:\quake\myfiles and then run quake -game myfiles. What happens then is that Quake will look first in the myfiles subdirectory for the various files it needs (scripts, graphics files and compiled Quake-C) and any it doesn't find there it defaults to those in the idl directory.

Name	Description	Notes		
Void	Used to indicate that a function doesn't return anything.	Not a type at all – rather the lack of one – and not really necessary. But Quake-C requires it just as C and C++ do. Strangely, you can declare variables of type void – and you will find some defined in the entity type providing markers (see below).		
Float	Floating point	general purpose number type, used for integers and booleans as well. alid values are 1, 4.7, -100 but not .5 which would have to be written 0.5 ote also that Quake-C is easily confused by negative constants eg foo-5 would cause a arsing error. foo - 5 won't.		
Vector	Used to represent co-ordinates in 3D space. Made up of 3 floats.	If vector foo is defined as vector foo = '1.0' '0' '255' then implicitly three float variables are also defined: foo_x, foo_y and foo_z with the values 1.0, 0 and 255 respectively.		
String	A character string Eg 'You were fragged'. Use \n for newline.			
Entity	An object in the game, like a player a monster, a wall or a nail from the nail gun. This is Quake-C's feeble attempt at supporting objects. In some ways the except that there's only one structure available – entity – and you cannot extructures (although you can, if you're careful, extend the entity type and structures)			

Table 1 - Types available in Quake-C.



Quake-C

John Carmack of ID software, who wrote the Quake-C compiler frontend, has this to say about the language: 'This is the last major component of the Quake utilities to be released. To be honest, I have been a little reticent to release this because most of the actual qc is rather embarrassing crap. The time never became available to even give it a good top to bottom going over. I never spent any quality engineering time on my parts... It is a mess... if you look through the code and occasionally think "This is stupid!" you are probably right...'

He is a bit hard on himself. Sure, if you compare Quake-C with something like C, Pascal or BASIC then it comes off very badly. As a 'proper' programming language Quake-C is a disaster. However if you view it as a structured scripting language for driving the Quake engine then things look a little brighter. And at least the boys at ID commented their code!

ID used Quake-C to write everything that most of us would consider to be Quake – the monsters, the items, the explosions, and the levels. Thus, you can modify all of these things within Quake-C to customise the entire game world. Threewave, for example, has used Quake-C to add a 'capture the flag' mode. Others have used it to add bots (robotic players) for playing solo deathmatch. The limit seems to be your imagination. You could, I am sure, write a completely original 3D game in Quake-C on top of the Quake engine.

So what is the language like? One way of looking at it is as a variant of C, and indeed some of the language constructs are very similar to C (to such an extent that if you know C you can probably get started pretty quickly with Quake-C). And then you notice all the differences. Some are quite minor (like the syntax of function declarations and definitions), some are just a pain (there are no modules or object files), and some are really annoying (principally the very limited error checking and the rather nasty 'gotchas!' like the way it makes assumptions about constants and nesting of function calls (don't!)). In truth, as a general purpose programming language Quake-C is a miserable failure.

In this article I'll only be covering the basics of Quake-C programming – primarily concentrating on modifying the existing .qc files rather than trying to begin from scratch writing a whole game. If you are interested in writing something from scratch then I've given some references in the bibliography in a separate box.

Structural engineering

Here's a simple example from the client.qc file: this is the code that is run when the player enters the console command kill which causes the player to suicide and re-start in a deathmatch game.

```
/* ClientKill
   Player entered the suicide command */
void() ClientKill = {
   bprint (self.netname);
   bprint (" suicides\n"); set_suicide_frame ();
   self.modelindex = modelindex_player;
   self.frags = self.frags - 2; // extra penalty
   respawn ();
};
```

As you can see Quake-C looks a lot like plain old C, but look a bit closer and even in this trivial example you'll notice some differences, in the function definition and declaration. Quake-C functions are declared as:

```
void(entity myself) ActivateHolo =
  local entity newholo;
  newholo = spawn();
  newholo.solid = SOLID_NOT;
  newholo.movetype = MOVETYPE_NOCLIP;
  newholo.origin = myself.origin;
  newholo.angles = myself.angles;
  newholo.colormap = myself.colormap;
  setmodel (newholo, "progs/player.mdl");
                       "holo";
  newholo.classname =
  newholo.owner=myself;
  newholo.frame=13;
  newholo.nextthink = time + 8;
  newholo.think = RemoveHolo;
  myself.currentammo = myself.ammo_cells
                     = myself.ammo_cells - 10;
  myself.items = myself.items | IT_HOLO;
  stuffcmd (newholo.owner, "bf\n");
  sprint (newholo.owner, "holograph activated\n");
```

Listing 1 - ActivateHolo.

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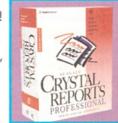
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Name	Туре	Description	
World	world	The server's global object that holds everything, for example deathmatch flags.	
Time	float	The current game time. It is possible for the current game time for different entities in Quake to be diff but the difference is limited to 0.1 of a second which is also the limit of the resolution of time. Time is normally used to tell the Quake engine that in a certain amount of time from the current time you particular function to be called. Sort of a hacked alternative to threads!	
Frametime	float	Only used when jumping in water.	
Self	entity	This is the entity that is the subject of the function that was called. This is sort of the equivalent of C++'s this	
Other	entity	Go on – guess! When an impact occurs between a player and a wall, for example, then self would be set to the player and other to the wall. In Quake's monster Al when a monster was considering who to target then self would be the monster and other the target (usually but not always the player).	
force-retouch	float	This is treated sort of like a boolean in that if it is non-zero then it forces all entities to touch triggers. It is decremented each frame (and thus is usually set to 2 to ensure it catches everything). This is needed for entities that wouldn't normally touch triggers (eg non-moving ones) when something like teleport is activated.	
Mapname	string	Name of the current map eg 'start' or 'end' or 'dm4' or 'ctf1'.	
Deathmatch	float	Actually a boolean ie 1 = playing deathmatch, 0 = not.	
Teamplay	float	Actually a boolean ie 1 = can hurt team members (players with the same colour pants) 0 = can't. Requires deathmatch = 1.	
Coop	float	Actually a boolean ie 1 = co-operative, ie there are monsters and the players are trying to work together to k them. 0 = not.	
Serverflags	float	Used to keep track of completed episodes. If serverflags & (1 << e) is true then episode e has been complete	
total_secrets	float	The number of secrets in the current level.	
found_secrets	float	The number of secrets found	
total_monsters	float	The number of monsters in the level. Or rather the total number of monsters spawned since the level started (le the sum of all the monsters currently in the level plus those that have been killed).	

Table 2 - The globally defined variables.

<return type> (parameter list) <function name>

with a maximum of 8 parameters.

Also you'll notice the structure of function definitions is:

<function definition>= { <function body> };

In Quake-C you can declare names (including function names) as many times as you like, until you finally define it. All names must be unique, to the extent that you cannot even have a variable with the same name as a field in an entity (or a function). The exception to this rule is local variables, which are scoped – you could have several local variables in different functions with the same name, but they cannot have the same name as a globally defined variable, function or field.

Entity relationships

The basic types available in Quake-C are shown in Table 1.

The entity type is significantly different from all the other Quake-C types in a number of ways. Firstly, in order for an entity to function properly it has to be 'registered' with the Quake engine so that the engine knows when to do things like call functions on it. Secondly it's a composite type (like a C structure) – that contains a mix-

Name	Description	
parm1	items bit flag (IT_SHOTGUN IT_AXE)	
parm2	Health	
parm3	Armour	
parm4, parm5, parm6, parm7	Ammunition	
parm8	Current weapon	
parm9	Armour type	
parm10-parm16	Used when the client connects.	

Table 3 - Parameters.

ture of different fields of other types, as well as fields that are references to functions. These functions are roughly equivalent to member functions in OO languages, and are invoked by the engine when certain situations arise.

It is possible to create your own entities based on Quake's entity type. Unfortunately, while it would be nice to use inheritance to do this that's not possible. Instead what you have to do is edit defs.qc (which is the first file read by the Quake-C compiler) and add any extra fields you want after the globals section – ie after the void end_sys_globals; and the void end_sys_fields; fields. Make sure when you're adding anything to add them after both of these – if you don't you'll have to recompile quake.exe, which might prove difficult.

You don't actually need to do anything to defs.qc in order to create a new entity if you don't need to add any new fields – you could just use the existing entity and set up a unique (new) set of values for it. The example in Listing 1 shows the definition and creation of a new entity – a hologram that follows the player around, eliciting attacks that (because the hologram is not solid (SOLID_NOT)) have no effect at all.

There are a couple of basic things that, though they seem obvious, you should be careful to avoid. For instance, don't change a value in the entity object directly – in some cases this will invalidate some of the Quake engine's internal data structures. Oh, for private data. For example, if you want to change an entity's position, you have to use the built-in function <code>setposition()</code>. This will ensure the value held in the entity and in the Quake engine's internal structures are kept in sync.

In other cases, an apparently simple operation actually requires quite a degree of legerdemain. If you want to change the velocity of an entity, for example to make it bounce off a well, you have to set the entity.movetype to MOVETYPE_BOUNCE, then set things up so that the next piece of handling code gets called in 1/10th of a second. To

do this, set entity.nextthink to time + 0.1 (time is a global variable that holds the game's current time) and entity.think to myfunction, a new function which will set entity.velocity to the value you want. If the Quake engine were multi-tasking this would be much easier, but it isn't.

Quake-C compiler

There are some important differences from C that you should be careful of, especially as Quake-C doesn't even complain when you do things wrong – it just breaks (sometimes).

Most important is that if you assign a value to a variable when you declare it (for example: float foo = 1.4;), the Quake-C compiler assumes that foo will be constant (ie you won't change it's value) and generates code accordingly. Unfortunately, the compiler does not check constant status throughout – you could assign a different value to foo later and the compiler will allow it, but when you come to run it you have a nasty and difficult to find bug!

As I mentioned above, Quake-C has no modules, and no header files. They're not really needed, because there's no linker either and you can't compile qc files separately. It gets better: not only do you have to compile all your Quake-C files in one go (to produce the 'compiled' progs.dat file), but everything (other than local variables) is globally visible from the point it is declared onwards – even into the other qc files that are compiled. In other words, if you compile foo.qc and baa.qc (in that order) then all functions and non-local variables declared in foo.qc are available in baa.qc (but not the other way around).

Error recovery during compilation is minimal. The compiler skips to the next global definition, so you will never see more than one error at a time in a given function, and compilation aborts after ten error messages.

Composition of function

Since all the functions use a single parameter marshalling area, and a single global variable to store their return result, you should *never* try to call a function within another function call. For example, printing the coordinates of entity.self with

sprintf(self, vtos(self.origin));

will fail miserably (sending the message to somewhere in hell). It should be replaced by:

text = vtos(self.origin);
sprintf(self, text);

Unfortunately, this applies to operators as well:

References & acknowledgements

'I have stood on the shoulders of giants.' In writing this article I have relied on work from a large number of people who have spent time dissecting Quake. I have done my best to acknowledge all of them – if I haven't then I apologise.

ID Software: http://www.idsoftware.com

The focus of Quake: Quake-C at

http://www.cs.loyola.edu/~bsmith/quake/quakec/

The Quake stomping grounds: http://www.stomped.com/

Frodo's Quake-C reference page:

http://136.165.243.183/~frodo/index.html

Quake-C HQ: http://www.qchq.com/page1.html

Ferrera Francesca and Oliver Montanuy for their Quake-C manual.

Funct	tion	Name	Description
void	()	main;	Used for testing.
void	()	StartFrame;	Called at the start of each frame.
void	()	PlayerPreThink;	This is called for the player (ie self=Player) for each frame before physics is run (gravity, etc).
void	()	PlayerPostThink;	As above but called after physics is run.
void	()	ClientKill;	Called if the player commits suicide (issues the 'kill' command from the console.)
void	()	ClientConnect;	Called when the client connects to the server. It's also called whenever a new level starts in a Deathmatch game for each player.
void	()	<pre>PutClientInServer;</pre>	Called after setting up parm1 to parm16
void	()	ClientDisconnect;	Called after a player discon- nects from the server and announces the player has left the game ('Judge Dredd left the game with 57 frags')
void	()	SetNewParms;	Called when a client first connects to a server so that the parameters for that client/ player can be saved (parm1 to parm 16).
void	()	SetChangeParms;	Called so the values parm1 to parm16 can be changed.

Table 4 - Quake-C functions.

```
sum = anglestovec(45) + anglestovec(90);
will fail, and should be replaced by:
sum = anglestovec(45);
sum = sum + anglestovec(90);
```

Variables, clients and players

There are a number of global variables defined within the Quake engine, available regardless of what you do in the progs.dat code. These are shown in Table 2.

There are also 16 general purpose parameters (of type float) which could be used for anything, but in shrink-wrapped Quake are used as shown in Table 3. The first 9 hold information about the player. The last 7 are used to pass values during client connection. Of course, if you were rewriting the whole of the Quake-C portion of Quake from scratch then you could use them for anything you like.

In Quake, you have Quake clients connected to a Quake server. Clients have values such as frag total (in deathmatch games), name and colours. Players, by contrast, are represented by a type of entity (qv), and have attributes (held in paraml-param9) including health, ammo, armour etc. A new player entity is created every time you start or re-start in a game of Quake and is destroyed each time you are killed.

In C the only function you absolutely have to provide is a main(). In Quake-C, because what you are actually writing is a script file for the Quake engine, you have to provide a number of entry point functions, as shown in Table 4. These are not the only functions in your Quake-C code that the Quake engine can call – just the mandatory

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```
void(entity me, entity camera) NezuSetViewPoint =
  // Set view point
                            // target of message
  msg entity = me;
  WriteByte (MSG ONE, SVC SETVIEWPORT);
                            // 5 = SVC SETVIEWPORT:
                                           // view port
  WriteEntity (MSG_ONE, camera);
  // Also set angles, otherwise it feels strange
  // NezuSetViewAngle(me, camera.angles);
  WriteByte (MSG_ONE, SVC_SETVIEWANGLES);
                             // 10 = SVC SETVIEWANGLES
  WriteAngle(MSG_ONE, camera.angles_x);
                                           // tilt
  WriteAngle(MSG_ONE, camera.angles_y);
                                           // yaw
                                           // flip
  WriteAngle(MSG_ONE, camera.angles_z);
```

Listing 3 - Moving the viewpoint.

```
void() Teleport_to_bomb =
  local entity oldself, bdest;
  bdest=spawn();
  bdest.origin = self.telebomb.origin + '0 0 27';
    Blow up the bomb ...
  oldself=self;
  self=self.telebomb;
  GrenadeExplode();
  self=oldself:
     Teleport to the bomb's old location
  if(self.health <= 0) {
    remove(bdest);
    return;
  // Recreating the "teleport_touch" function here,
  // once again
  spawn_tfog (bdest.origin);
  spawn_tfog (bdest.origin);
  spawn tdeath (bdest.origin, self);
  setorigin (self,bdest.origin);
  self.teleport time = time + 1;
  // Longer teleport recovery time
  self.flags = self.flags - self.flags & FL_ONGROUND;
  remove (bdest) :
```

Listing 4 - Teleporting.

ones. You can define what are effectively (although this is not enforced) member functions of entities, operations that are called in response to certain events like being hit, or a timed event set by the entity.nextthink entity field.

A couple of tricks

The example in Listing 2 is extracted from one of the patches available on the Net. The patch as a whole sets things up, so that when a player hits a monster with an axe, the monster becomes the player's 'pet', following it around and attacking any other monsters (or players) that come near. The fragment shown here is the target selection routine, whereby the 'pet' monster loops through all the monsters and players, checking whether it can see them (traceline()), and then selecting the nearest as its target. You'll see two special conditions are handled — firstly, if the target is another player (if (selected.classname == "player")) then an appropriate message is broadcast (sprint (selected." sent one of his minions after you!\n");). Secondly the conditions (head != self.owner)

```
float() Pet_FindTarget =
  local entity client;
  local float
  local entity head, selected;
  local float dist;
  dist = 10000;
  selected = world;
  head = findradius(self.origin, 10000);
  while (head)
    if ((head.health > 1) && (head != self)
                          && (head != self.owner))
    traceline(self.origin, head.origin, TRUE, self);
      if ((trace_fraction >= 1)
           && (vlen(head.origin - self.origin) < dist)
           && (head.owner != self.owner))
        selected = head:
        dist = vlen(head.origin - self.origin);
    head = head.chain;
  if (selected != world)
    sprint (self.owner, "Pet attacking -> ");
    if (selected.classname == "player")
      sprint (self.owner, selected.netname);
      sprint (selected, self.owner.netname);
      sprint (selected,
           " sent one of his minions after you!\n");
      sprint (self.owner, selected.classname);
    sprint (self.owner, "\n");
                 self.enemy = selected;
                 FoundTarget ();
                 return TRUE;
    if (self.goalentity != self.owner)
        self.goalentity = self.owner;
        self.think = self.th_run;
    self.ideal vaw = vectovaw
                     (self.owner.origin - self.origin);
    self.nextthink = time+0.1;
    return FALSE;
```

Listing 2 - Finding a target.

and (head.owner != self.owner) ensure that the 'pet' doesn't turn on its owner - or another of the owner's 'pets'!

Two other common Quake tricks revolve around altering the view point of (typically) a player (it could also be the viewpoint of a client – which is what a player is when he's not playing! Sort of.). Plain-old vanilla Quake does this whenever a player is fragged to give him a view as if he was seeing out of the eyes of his still twitching corpse on the ground. Other applications include providing a 'missile-eye' view of a rocket when it's fired, so that the player can guide it. As a last round of tricks, Listing 3 shows how you can alter the viewpoint, and Listing 4 contains an excerpt of another common patch, which implements teleporting.

Edward Kenworthy is better known in the Quake Deathmatch community as 'Judge Dredd' and can usually be found on the easynet and gamesmaster Quake servers. So why not come along and be fragged. Just remember 'I am Duh Law'. Alternatively you can email him at ekenworthy@cix.compulink.co.uk

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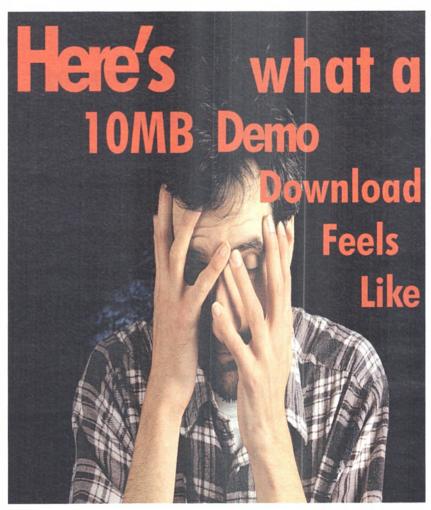
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WEXTECH

So glad you could COM

The efficiency of C++ has always looked good to ActiveX developers, but it has never been easy to use. Version 5.0 of Visual C++ is set to change that, as Dave Jewell explains.

Visual C++ 5.0 is one of the principal components in the new monster-sized Visual Studio (previously known as 'Boston') package, which includes Visual J++ 1.1, Visual FoxPro 5.0, Visual Basic 5.0, Visual SourceSafe 5.0, Internet Studio 1.0, and a host of other goodies. I'm told that if you install the whole shooting match (don't try this at home folks!) you'll need something like 2 GB of disk space. Thankfully, Visual C++ 5.0 is available separately; the Professional version requires between 30 MB and 220 MB of disk space depending on the options installed and whether you install all the documentation and samples onto your hard disk. For the Enterprise version, disk space requirements are between 35 and 345 MB.

Despite the new version number, there have been no major changes to the development system. Visual C++ remains stubbornly nonvisual (by way of contrast, see the review of C++Builder in the April issue), and one can't avoid the idea that its version number has only been upped to 5.0 for the sake of name-compatibility with the rest of the Visual Studio suite (see Figure 1) – this wouldn't be the first time that Microsoft has done this. Lest you think I'm being a tad harsh, Microsoft itself seems to agree: 'You'll have to dig to find most of the updates from previous versions of Visual C++' (Microsoft Program Manager Mary Kirtland, MSJ May 1997).

What's new in 5.0?

What's actually different in 5.0, and is it worth the upgrade? Notable changes include an improved code generator in the compiler, which is claimed to generate code that's both faster and approximately 10% smaller than that produced by Visual C++ 4.2. This is no mean feat, since the Microsoft compiler was already (in my opinion) state of the art, and generates better code than anything else I've used. In days gone by, Watcom compilers held this particular crown, but the last few Watcom C++ compilers have had some pretty spectacular gaffs in the code generation department (hint: if you're thinking about buying Watcom, wait for Version 11.1). On the whole, I'd say that Microsoft currently rules the roost in this area.

Still on the subject of the compiler itself, support for a raft of the latest ANSI C++ features has been added, including the new explicit, mutable and typename keywords, and the bool type with its supporting true and false constants. Intel's MMX instruction set is supported with the /GM compiler option, which permits MMX instructions in inline assembler. MMX instructions are also supported in the debugger's disassembly window, but not in the register window.



d Humphries @

One of the most irritating new features of Visual C++ 5.0 is the help system's increasingly serious love affair with the Internet. Any time that you use the InfoView system to get help on a particular topic, you're never quite sure whether the system is going to try to access Microsoft's Web site. I assume that this is in order to get an informational update, but if you just click the Cancel button on the MSN connect dialog (or whatever – depending on the information provider you use), then the system, suitably chastened, will back down and display whatever locally held information it might have.

As you'd no doubt expect, enhanced COM support was pretty high on Microsoft's 'let's do it' list for Visual C++ 5.0. A new pre-processor directive, #import, has been added, which causes the compiler to read a type library and automatically generate the equivalent C++ header file to describe the library's interfaces. The compiler isn't limited to type library (TLB and ODL) files, either: you can specify the name of a DLL which contains a type library resource, or even an EXE file—in fact, anything which can be validly passed to the standard OLE LoadTypeLib function. The #import directive has a large number of additional options for more precise control over what information is generated: you can rename and exclude namespaces, specify prefixes for naming high-level properties and methods, and so forth.

Whither ActiveX?

Visual C++ 5.0 comes bundled with version 2.1 of the ATL (ActiveX Template Library), designed for creating smaller and tighter ActiveX components than are possible with other languages. Great fan of Delphi though I am, the fact is that both Delphi 3.0 and Visual Basic 5.0 are not ideal tools for creating components in situations where executable size is critical. For the moment, Visual C++ and the ATL remain the best option in these circumstances.

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```
// Calculate the points for each side
HRESULT CShapeCtl::OnDrawAdvanced(ATL_DRAWINFO& di)
                                                              for (int i = 0; i < m_nSides; i++)
 RECT& rc = *(RECT*)di.prcBounds;
                                                                m_arrPoint[i].x = (long)(dblRadiusx * cos(dblAngle)
 HDC hdc = di.hdcDraw;
 COLORREF colfore;
                                                                                          + ptCenter.x + 0.5);
                                                                m_arrPoint[i].y = (long) (dblRadiusy * sin(dblAngle)
  HBRUSH
            hOldBrush, hBrush;
            hOldPen, hPen;
                                                                                          + ptCenter.y + 0.5);
 HPEN
                                                                dblAngle += dblDiff;
   // Translate m_colfore into a COLORREF type
 OleTranslateColor(m_clrFillColor, NULL, &colFore);
                                                              Ellipse(hdc, rc.left, rc.top, rc.right, rc.bottom);
  //Create and select the colors to draw the circle
 hPen = (HPEN) GetStockObject (BLACK_PEN);
                                                              // Create and select the brush that will be
 hOldPen = (HPEN) SelectObject(hdc, hPen);
                                                              // used to fill the Polygon
 hBrush = (HBRUSH) GetStockObject(WHITE_BRUSH);
                                                              hBrush = CreateSolidBrush(colFore):
 hOldBrush = (HBRUSH) SelectObject(hdc, hBrush);
                                                              SelectObject (hdc, hBrush);
                                                              Polygon(hdc, &m_arrPoint[0], m_nSides);
  const double pi = 3.14159265358979;
 POINT ptCenter;
                                                              // Select back the old pen and brush and delete
                                                              // the brush we created
 double dblRadiusx = (rc.right - rc.left) / 2;
 double dblRadiusy = (rc.bottom - rc.top) / 2;
                                                              SelectObject(hdc, hOldPen);
 double dblAngle = 3 * pi / 2; // Start at the top
                                                              SelectObject(hdc, hOldBrush);
  double dblDiff = 2 * pi / m_nSides;
                                                              DeleteObject(hBrush);
                       // Angle each side will make
                                                              return S_OK;
 ptCenter.x = (rc.left + rc.right) / 2;
 ptCenter.y = (rc.top + rc.bottom) / 2;
```

Listing 1 - The Shape control's drawing code.

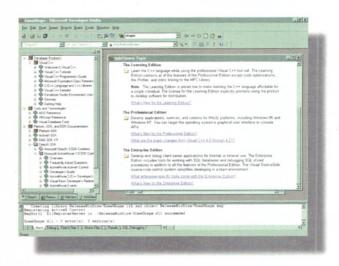


Figure 1 - Visual C++ in action in the new Developer Studio.

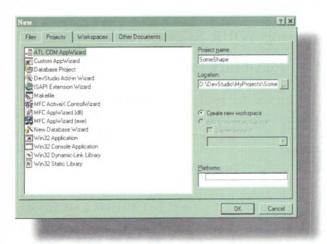


Figure 2 – When starting a new Visual C++ project, you get a large number of choices regarding what type of project to go for. The one we want is ATL COM Wizard.

The new version of ATL is more tightly integrated with the IDE, and provides a set of wizards for what Microsoft refers to as 'visual COM editing'. To demonstrate how these gizmos work, we'll walk through the process of creating a control. This walk-through is shamelessly based on an example in



Microsoft's online documentation, though I've left out some of the minor details for the sake of brevity, and changed a few things around.

Okay. You start off by clicking 'new' on the 'file' menu, and you get presented with the dialog box shown in Figure 2. This let's you choose what it is you want to create - a single file, a project, a workspace or whatever. Because I have Word 97 installed on my system, 'Word Document' appears as an option on the 'Other Documents' page of the dialog, and if I select this option, the magic of OLE gives us the various Word 97 toolbars running inside Developer Studio. If you choose ATL COM AppWizard, enter a new name for the project, and click OK, then you'll see the new ATL wizard running as shown in Figure 3. Because we're creating an ordinary Active-X control which runs as an inprocess server, we want to select DLL as the Server Type. The Support MFC check-box allows us to use lightweight MFC classes such as CString inside our control code, while the check-box above allows the proxy/stub marshalling code to be integrated into the main project instead of ending up in a separate DLL. You'll also notice that there's an option for creating NT services - oh, joy...

Once you've hit the 'Finish' button and created your new project, you end up with an interesting assortment of make files, source files, headers and so forth. At this point in time, all we've got is an empty ATL project; in order to make things more interesting, we need to add one or more controls to the project. In order to do this, we invoke the ATL Object Wizard from the Insert menu. This leads to the dialog shown in Figure 4. From here, select the Controls category and you'll see three items listed in the right-hand pane; Internet Explorer Control, Property Page and Full Control. Since we're creating an ActiveX control, we choose Full Control and click the OK button.

This leads to a further dialog box which allows you to set up many aspects of your control, including it's name. From this dialog, you can specify whether or not your control will support rich error

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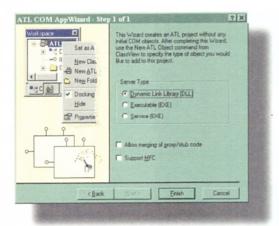


Figure 3 – Here's ATL Com Wizard in action. You can decide whether you want to use lightweight MFC classes in your project, and there's even an option for creating NT-style services.



Figure 4 – The ATL Object Wizard lets you add new object types to an existing ATL project. Here, we've chosen the Control page and we're about to add a new ActiveX control to the project.

You'd also come here to add a property page for your control.

```
library SOMESHAPELib
  importlib("stdole32.tlb");
  importlib("stdole2.tlb");
    uuid(2EF1FB7E-BBF0-11D0-AB25-444553540000),
    helpstring("Event interface for ShapeCtl")
  dispinterface ShapeEvents
    properties:
    methods:
    [id(1)] void ClickIn([in]long x, [in] long y);
    [id(2)] void ClickOut([in]long x, [in] long y);
  3:
    uuid(2EF1FB7D-BBF0-11D0-AB25-444553540000),
    helpstring("ShapeCtl Class")
  coclass ShapeCtl
    [default] interface IShapeCtl;
    [default, source] dispinterface _ShapeEvents;
  };
```

Listing 2 - A section of the someshape.idl interface definition file.

information, and determine which of the standard ('stock') properties will be implemented in your control. Using this dialog, you can also elect to base your control on one of the existing, predefined window classes. If you do this, your new control will create and super-class a window of this



type at run time, passing messages to the super-classed window to implement much of the control's default behaviour.

When you click OK, the necessary source files will be automatically created and added to your control project. You even get a small registry script file to register the control once it's been built and a HTML test page for checking out the control from within Internet Explorer. Of course, before you can do this, you've got to build the control using the appropriate option on the Build menu. Once this is done, you can fire up the aforementioned HTML test page (or use the ActiveX Control Test Container application if you want to be boring) and your new control will be revealed in all its glory – as in Figure 5. At this point, our supposedly 'lightweight' control is 262 KB in size but be fair – after all, this is a debug build.

Custom properties

That's stock properties dealt with, but how do you define a new custom property? Open the ClassView window and right-click on the IShapeCtl interface. This is the interface that implements any custom properties defined for the control. At the moment, it contains just one (stock) property, FillColor, but now we're going to add another.

When you right-click on the interface class, you'll see a small popup menu with an 'add property' item, which takes you to the 'add property to interface' dialog. Here, we're specifying a new property called Sides, of type short. In the 'implementation' area, you can see the code that will be generated by our adding this property. As with systems like Delphi and Visual Basic 5.0, separate 'get' and 'put' routines are defined for reading and writing the property. What Visual C++ doesn't do, however, is automatically create a class member in which to store the new property. That's not unreasonable, since some property values obviously won't map to an actual variable. To add a member variable for the property, open the ShapeCtl.h file and add the necessary definition after the m_ClrFillColor member. The resulting code is shown below. As well as the m_nsides member, we've added a 100-entry array to store the shape's calculated points.

```
// IShapeCtl
public:
   STDMETHOD(get_Sides)(/*[out, retval]*/ short *pVal);
   STDMETHOD(put_Sides)(/*[in]*/ short newVal);
   HRESULT OnDrawAdvanced(ATL_DRAWINFO& di);

OLE_COLOR m_clrFillColor;
   short m_nSides;
   POINT m_arrPoint[100];
};
```

All you need do now is implement the get and put functions. The IDE automatically generates skeleton get_Sides and put_Sides routines for you, so you just have to fill in the blanks. The resulting code should look like this:

```
STDMETHODIMP CShapeCtl::get_Sides(short * pVal) {
  *pVal = m_nSides;
  return S_OK;
}
STDMETHODIMP CShapeCtl::put_Sides(short newVal) {
```

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```
if (newVal > 2 && newVal < 101) {
   m_nSides = newVal;
   return S_OK;
}
else return Error
   (_T("Shape must be between 3 and 100 sides"));</pre>
```

The code ensures that values of the Sides property lie between 3 (you can't have a two-sided polygon!) and 101 (the array can only hold 100 points).

The next job is to set an initial value for Sides. I've specified that the fill colour should default to green.

```
CShapeCtl()
{
  m_nSides = 3;
  m_clrFillColor = RGB(0, 0xFF, 0);
}
```

Having implemented the Sides property, the next job is to write the drawing code that makes use of it, as in Listing 1. Note that we need to include math.h into ShapeCtl.h, since we are making use of trigonometric functions.

You can then build the control and try it out in the container of your choice. I favour Visual Basic, because Internet Explorer won't let you tweak the control's properties, and the ActiveX Control Test Container is about as user-friendly as a cornered rat. If you alter the FillColor property, you'll find that the control will instantly redraw itself in the new colour, but if you massage the Sides property, the control will stubbornly sit there grinning at you until you force a redraw – by obscuring the control, for example. The problem, of course, is that we've changed the value of the m_nSides member, but we haven't told the control that it should immediately redraw itself when this property changes. To make this happen, we need to add a call to FireViewChange in the put_Sides method call. The new code looks like this:

Rebuild the DLL once more, and hey presto, instant cooperation from the control whenever the Sides property is changed.

Adding Custom Events

The next step is to add a couple of custom events to the control, in our case ClickIn and ClickOut, which will be triggered when the user clicks inside and outside the bounds of the polygon (but still inside the control, of course).

When creating new events, you must specify an event interface in the SomeShape.idl file. Part of this file is shown in Listing 2, with the necessary changes in bold. It's a shame that you have to manually add this stuff – there really ought to be another wizard to add custom events to the interface. Still, on with the show...



Figure 5 – Here's the initial, 'do-nothing' control running inside Internet Explorer. The initial drawing code (the bit that announces ATL 2.0) is automatically included by the ATL Object Wizard.

```
CShapeCt1
class ATL_NO_VTABLE CShapeCtl
  public CComObjectRootEx<CComSingleThreadModel>,
  public CComCoClass<CShapeCtl, &CLSID_ShapeCtl>,
  public CComControl<CShapeCtl>,
  public CStockPropImpl<CShapeCtl, IShapeCtl,
            &IID_IShapeCtl, &LIBID_SOMESHAPELib>,
  public IProvideClassInfo2Impl<&CLSID_ShapeCtl
            &DIID_ShapeEvents, &LIBID_SOMESHAPELib>,
  public IPersistStreamInitImpl<CShapeCtl>,
  public IPersistStorageImpl<CShapeCtl>,
  public IQuickActivateImpl<CShapeCtl>,
  public IOleControlImpl<CShapeCtl>,
  public IOleObjectImpl<CShapeCtl>,
  public IOleInPlaceActiveObjectImpl<CShapeCtl>,
  public IViewObjectExImpl<CShapeCtl>
  public IOleInPlaceObjectWindowlessImpl<CShapeCtl>,
  public IDataObjectImpl<CShapeCtl>,
  public ISupportErrorInfo,
  public ISpecifyPropertyPagesImpl<CShapeCtl>,
  public CProxy_ShapeEvents<CShapeCtl>,
  public IConnectionPointContainerImpl<CShapeCtl>
```

Listing 3 - The CShapeCtl class's inheritance list.

```
LRESULT CShapeCtl::OnLButtonDown(UINT uMsg, WPARAM
wParam, LPARAM lParam, BOOL& bHandled)
  HRGN hRan;
  // horizontal position of cursor
  WORD xPos = LOWORD (1Param);
  // vertical position of cursor
  WORD yPos = HIWORD(lParam);
   / Create a region from our list of points
  hRgn = CreatePolygonRgn(&m_arrPoint[0]
                          m_nSides, WINDING);
  // If the clicked point is in our Polygon
  // then fire the ClickIn event
  // otherwise we fire the ClickOut event
  if (PtInRegion(hRgn, xPos, yPos))
    Fire_ClickIn(xPos, yPos);
  else
    Fire ClickOut (xPos, yPos);
  // Delete the region that we created
  DeleteObject (hRgn);
  return 0;
```

Listing 4 – The code called when the user clicks the left mouse button within the control.

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Once you've recompiled to create the SomeShape.tlb type library file, you need to create a connection point for the events. To do this, go to the 'project' menu, click

'add to project', and select 'components and controls'. Then double click the 'developer studio components' folder, select 'ATL proxy generator' and insert it into the project by clicking the 'insert' button. The ATL proxy generator dialog appear, and from here you must select the newly created type library, move the _ShapeEvents interface across to the 'selected' box and then click 'insert' again to create a new connection point header file (which incidentally seems to get generated as a Unix-style text file without carriage returns!) The new connection point header file should be included at the top of ShapeCtl.h, immediately after the inclusion of resource.h.

Are we done yet? Not by a long way! The next step is to add CProxy_ShapeEvents (defined in the new header file) and IConnectionPointContainerImpl to the CShapeCtl class's inheritance list. At the same time, _ShapeEvents has to be set up as the default outgoing interface. Listing 3 shows the revised class declaration, with the changes in hold:

Still with me? The next job is to expose IConnectionPointContainer through QueryInterface by adding it to the COM map, and to tell ATL which connection points are available. This is done by adding the following line to the existing COM map:

COM_INTERFACE_ENTRY_IMPL(

IConnectionPointContainer)

You also need to add the following code after the COM map definition:

BEGIN_CONNECTION_POINT_MAP

(CShapeCt1)

CONNECTION_POINT_ENTRY(

DIID_ShapeEvents)

END_CONNECTION_POINT_MAP()

That (thankfully!) is it as far implementing the COM-level support code for your new event types, but you still need to write the actual code which triggers these events. To do this, add the following line to the message map in ShapeCtl.h:

MESSAGE HANDLER (WM LBUTTONDOWN, On L. Button Down)

You also need to add a function prototype for the new function to the public part of the IShapeCtl interface, after the OnDraw function declaration:

LRESULT OnLButtonDown (UINT uMsg, WPARAM wParam, LPARAM 1Param, BOOL& bHandled);

Finally, add the code in Listing 4 to the ShapeCtl.cpp source file. This code uses the shape's array of points to build a temporary polygon region, and then calls PtInRegion to determine whether the mouse-click fell inside or outside the region. If you rebuild your control with these changes, you'll find that you've got two new events which work as advertised.

Overheads

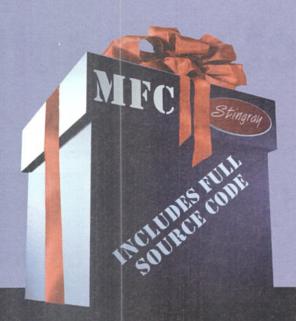
So is it worth upgrading to the new version? Speaking as an unashamed RAD-ical developer, I would much prefer to develop applications using Delphi or C++Builder. In fact, I'd probably run away screaming if I were asked to develop a large application using Visual C++. However, Microsoft's venerable workhorse still has one ace up its sleeve in the shape of ActiveX control development. If you want to create lean and mean ActiveX DLLs suitable for Web deployment, then nothing else comes close. When compiled with the 'Win32 release minsize' option, the shape control developed above comes down to around 85 KB, which isn't unreasonable when you remember that is used the math library. Without the maths, I imagine it would be significantly smaller.

What we're really talking about here is overhead: the overhead of Delphi's VCL library and the monster-sized Visual Basic run-time support DLLs make these products fundamentally unsuitable for creating Webdownloadable ActiveX controls. The ATL library, on the other hand, was specifically designed for creating small controls.

I wholeheartedly welcome the new ATL wizards, and 'visual COM editing'. However. as the above tutorial (abbreviated as it is) demonstrates, there's plenty more to do in this area. Adding methods and properties to an ATL interface is simple, but adding events is an incredibly tedious, counter-intuitive and error-prone process. Let's have an event wizard soon please, Microsoft! Criticisms aside, Visual C++ 5.0 is really the only choice for serious ActiveX control development.

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

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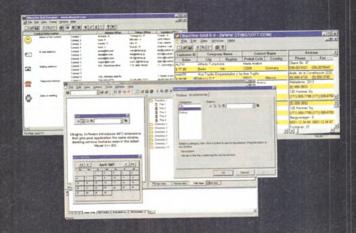
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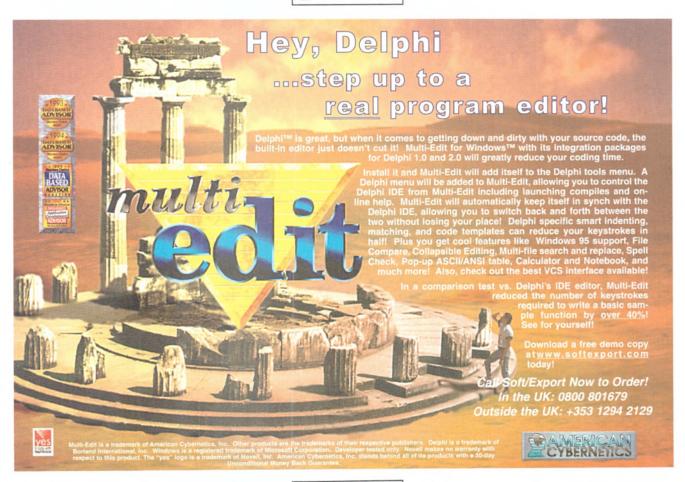
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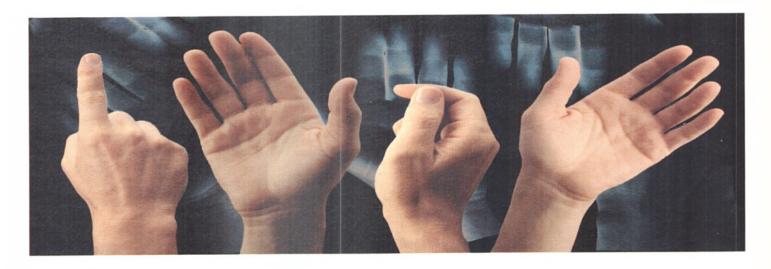
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Generation X



User-definable markup for Web documents is on its way. Last November, the World Wide Web Consortium announced XML as a successor to HTML.

Adrian Orlowski explains what all the fuss is about.

ast year many software houses must have breathed sighs of relief that they finally got their products Web-enabled. Word processors sprouted 'Publish as HTML' functions, Lotus Notes grew the ability to transform its text databases into Web format on the fly, and Adobe announced that henceforth Level 3 PostScript rasterisers would print HTML documents directly. What else could a user wish for?

Yet, like the arrival of comet Hale-Bopp, what could prove to be the most significant Web event of 1996 crept into view unheralded and largely unobserved outside of a small band of initiates into the arcana of text processing and electronic publishing. November's publication in draft form of the specification for XML (eXtensible Markup Language) is a harbinger of change. Far from celebrating HTML's glories, it more evidently reflects a wish for the end of Web text as the world and its dog have come to know it.

XML might even inspire similarly post-millennial visions of a new Eden across the globe for computer text. But as the film title had it, Heaven can wait, as can the visions of seers. What does XML offer, and what is that likely to cost?

Talking of the globe, XML finally mandates ISO 10646 (aka Unicode) as the underlying document character set, so you can refer easily to every glyph and ideogram in use today for text by a decimal or hex bitstring. Normal XML documents will have to specify which particular character encoding they use. All XML document processors have to be able to handle UFT-8 and UCS-2 encoding, and English language documents can default to UTF-8, but use of any other character sets such as Shift-JIS has to be announced in the document. Increasing the size of the base character representation means that a few HTML documents will grow in size when they become XML documents, but this part of the specification is undoubtedly a vote winner.

SGML inspiration

The way XML democratises markup for publishers is likely to vex applications developers rather more. XML introduces the concept of user-defined markup. W3C it seems has had enough of trying to sanction ever growing lists of tags for Web browser authors to aim for. It has again been inspired (as it was the first time around with HTML) by SGML (see SGML, it's a beautiful day in EXE February '97), although in quite a different way than before. Even when it conforms (ie when it has a document type definition or DTD), HTML at best is an application of SGML. XML, on the other hand, is near enough to SGML that it can correctly be said to be a subset of SGML. It has already garnered the moniker SGML-Lite.

The possibility that documents contain user-defined tag names effectively undermines the practice of Web browsers today of hard-wiring pre-defined processing semantics within software. What, then, is an XML document processor to do with tagged text? Like SGML, XML is purposely deaf to the question, but that question mark is not of course an EoF on the matter (merely entity-end, to adopt SGML-speak).

Two additional proposals will issue from W3C. A draft proposal for Web (and other) hyper-linking, called Extensible Hyper Linkage (XHL), has already been published. Although somewhat drafty at present, it looks like it will include and extend the established <a>Click-me-I'm-coloured HTML link semantics. And it promises to get the intellectual juices of red-blooded developers going with novelties such as multiple sources and/or multiple targets from one link, semantic content addressing, and hyperlink specifications which are extraneous to the documents they link (eg to link in read-only databases).

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Third leg

Towards the end of this year, W3C will publish the third leg of its strategy, and we will get to see how they envisage XML documents will be rendered by Web browsers of the future. Given the overwhelming tendency towards SGML, this is likely to be along SGML lines as well. In the meantime you can get some clues by pointing your current Web browser at Alta Vista and searching for DSSSL (Document Style Seman-

```
<html>
<title>Demo-ltr as HTML document</title>
</head>
<body text="#000000" bgcolor="#c0c0c0">
7 February 1996
Dear Peter,
Thank you for your kind reply to my query about
Armageddon<sup>TM</sup>. Here is my suggestion for an
enhancement you might consider for a future drop:
<img src="suggest.jpg" width="362" align="bottom" >
<a name="Flow1"><font size="-2">
Suggested enhancement to Armageddon</a></font>
<!- Notice the interleaved tags just here ->
All the best for the forthcoming full product
release.
Yours sincerely,
<strong>Adrian</strong>
<d1>
<dt>Encl:</dt><dd><a href="#Flow1">Suggested
enhancement to Armageddon</a></dd>
</body></html>
```

Listing 1 - An HTML document.

```
<?XML VERSION="1.0" RMD="INTERNAL" encoding="UTF-8" ?>
<!DOCTYPE fake SYSTEM "c:\nul\nul.dtd"
<!NOTATION jpg "JPG" "JPGsInAFlash.exe"
<!ENTITY trade
                 "<sup>TM</sup>" >
<!ENTITY suggest SYSTEM "c:\let\suggest.jpg" NDATA jpg >
<!-* the DTD alluded to here does not exist and is not
required to, because of the RMD attribute value in the
preceding processing instruction. BTW, this is an XML
comment. Notice its delimiters *->
<demo-ltr from="Adrian">
<date>7 February 1996</date>
<dear>Peter</dear>
<body>
<para>Thank you for your kind reply to my query about
Armageddon™ . Here is my suggestion for an
enhancement you might consider for a future
drop:</para>
<picture id='Flow1'><graphic name="suggest"/>
<title>Suggested enhancement to
Armageddon.</title></picture>
<para>All the best for the forthcoming full product
release. </para>
</body>
<Yours>sincerely</Yours>
<Encs><item><crossref refs="Flow1"/></item></Encs>
</demo-ltr>
```

Listing 2 - An XML version of Listing 1.

tics and Specification Language), or more specifically a simpler variant called DSSSL-Online.

If W3Cs overall strategy for XML is a three-legged pitch, those legs are by no means joined at the hip. XML document processors are not required to sup-



port Extensible Hyper Linkage if the specific need is not there. (XHL, its worth pointing out, is proffered up as much to the SGML community as to Web people). Likewise XML document rendering looks as if it could be performed satisfactorily by a browser implementing Cascading Style Sheets (CSS1), independently of what W3C come up with in due course.

In fact, with just one leg of the XML stool more or less in place, Microsoft and Sun have already demonstrated it can be sat upon. In March, Microsoft announced it had submitted to W3C the channel definition format (CDF) proposal, for broadcasting push content over the Web. More pointedly, they announced Internet Explorer 4.0 would implement it. The CDF specification is based on XML, and an XML document type definition (DTD) is included. Hot on Microsoft's heels, and perhaps more impressively, Sun's John Bosak announced to comp.text.sgml that the Solaris 2.5.1 manuals are available in XML form.

Although XML is hoped to shape Web browsers of the future, what seems to be exciting the *cognoscenti* are the possibilities of custom XML document processors. Publishers with specific types of binary as well as textual data can create software which uses an open document format but hard-codes the rendering semantics (for example, for commercial or proprietary reasons). That, of course, is where Java enters the picture. But while there are no particular issues about mixing Java in with XML documents, the availability of Java byte-code decompilers could be another matter to those wishing to hard-code. But the real importance of XML to its progenitors is not for better eyecatching graphics in the service of marketing, but for textual information interchange, with strong implications for client-side manipulation of the downloaded information.

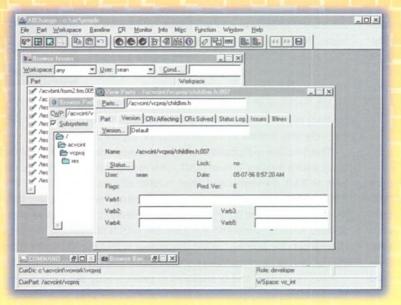
Reprocessing centre

Unlike HTML, which has never found much purpose in life except as a presentation format for documents, XML documents are expected to be re-processible. In this respect they mimic SGML documents, but SGML (as probably all experienced practitioners would admit) is simply too darned hard for the mass market. Not the syntax, which can be hidden behind 'smart' SGML tools, but the process of developing SGML applications. There is an uncomfortably intimate connection between SGML the meta-language for designing specific document markup languages, and SGML the environment for parsing documents marked up in those languages. It means that a parser for even one specific type of SGML document (DTD) will end up knowing more SGML than should be necessary.

XML has been expressly shaped to make it easy to write parsers for the tag sets that users are expected to come up with. One estimate (from someone who has written a full scale SGML parser) of the time required is a couple of days. And that begs the question whether, affirmations in the proposal aside (*methinks it doth protest too much*), one is actually dealing with realistic SGML when engaged on XML. The XML draft does indeed list what has been dropped from SGML in its metamorphosis into XML (which is incomplete), but you're likely to get a better sense of the situation by comparing the broad syntactic differences between an HTML document and its XML equivalent.

One major difference from HTML is that with one exception XML documents have to have tags as matching start/end pairs. Eliding the end-tags such as ${\scriptsize </\,P>}$ from paragraph elements as you can in HTML

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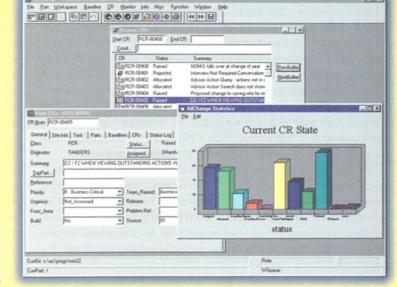
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References

The XML situation is developing rapidly, particularly in the area of tools. The following URLs will help locate up-to-date materials:

http://www.ucc.ie/xml/#FAQ-BROWSER

http://www.w3.org/pub/WWW/TR/WD-xm/-970331.html

http://www.microsoft.com/standards/cdf.htm

http://www.sil.org/sgml/related.html

Commonly Asked Questions about the Extensible Markup Language
Extensible Markup Language (XML) [W3C Working Draft 31st March 1997]
Channel Definition Format (CDF)

SGML: Related Standards [many links to material on XML and DSSSL]

is not permitted. However, where an element genuinely has no content, this can be indicated either by including an end-tag, or by signalling the fact on the (start) tag (or by using a DTD and forcing a processor to read it and remember elements declared as EMPTY, natch). This means for example that HTML's horizontal rule element will usually end up being written in XML either as:

<HR></HR>

or as:

<HR/>

A second significant difference from HTML is that XML documents can designate full-blown subsidiary units of text or binary data as entities for in-line inclusion during processing. In HTML, entities exist only as an alternative encoding of certain characters (such as the ampersand or less-than character). But in XML (as in SGML), entities can be physically distinct text or binary objects. Binary entities are syntactically restricted to being attribute values for tags, and they are required to bear a user-defined typing (called a *notation*) so a program can invoke an appropriate subsidiary processor for them. On the other hand, text entities can include markup (in a different encoding if desired). To keep things crystal clear for parsers, the <, > and & characters are allowed in document content only as XML entities, eg as & amp;

No need for DTDs

However, the most fascinating aspect of having to deal with tags that you've never seen before is the prospect of comprehensively structured documents which don't allude to any prior formal specification of their structure. Like SGML, XML has document type definitions for pre-declaring the allowed arrangement and combination of tags in the logical structure. But whereas an SGML parser uses DTDs to infer tags where none exist in documents (it expedites entry of markup by hand), XML stands this idea on its head. If you don't need to be inferring tags from the context (because the tagging is *de facto* explicit and comprehensive), then you don't necessarily need a DTD around. *Ergo* your Web browser or full text indexing engine does not need to be built to understand DTDs. XML calls these documents 'well-formed' (subject to certain fairly easy to satisfy constraints).

So what's to stop you ignoring DTDs altogether and pushing about XML documents without them? For one thing, the document must announce whether it requires a processor to be cognisant of an accompanying DTD or not, and it is a reportable error if the processor discovers some monkey business going on. In other words, the processing results could well be (in the immortal epithet) undefined. For some applications, there will be XML DTDs, and some processors will have to parse them in detail. But the outlook is not as bleak as it might appear; as in the SGML sphere, it's likely that XML DTDs will emerge that will gather widespread support. And the declaration of sub-element content in XML DTDs has been simplified compared to SGML—again, with the application developer in mind.

You might want to judge the situation for yourself. Figure 1 shows a trivial (and probably unrepresentative) ${\rm HTML}$ document, and Figure 1.

ure 2 is my attempt at an XML version of this document. Picking off the tags visually should make it clear it is a different kettle of markup. For comparison, regular readers might also want to look up my February EXE article on SGML, where the original



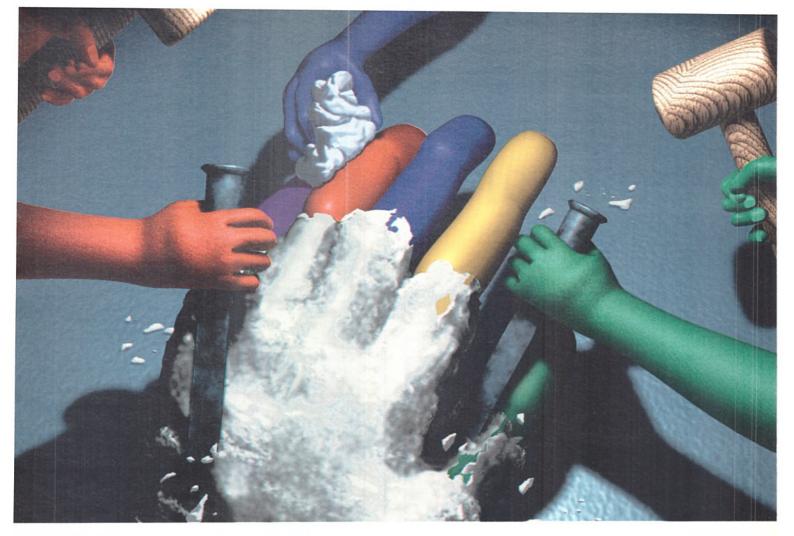
SGML version of the document is shown making use of SGML markup minimisation. (The SGML DTD shown there will not unfortunately pass muster as an XML DTD for Figure 2 as it stands).

The first line in Figure 2 is crucial in announcing the nature of the beast which follows. It is an (XML) processing instruction which signals an XML document and gives version and encoding details. The RMD attribute stands for the Required Markup Declaration, and indicates whether or not DTD processing is necessary. The possible alternatives here of None and All here are self-explanatory; Figure 2 though opts for Internal. What this means is that the XML processor can ignore the external subset of the DTD called fake alleged to be in c:\nul\nul.dtd, and is required to process only the declarations between the [and] brackets which follow the DOCTYPE keyword. The three declarations in the internal DTD subset in Figure 2 define meanings for the ™ entity in the first para element and for the JPG image referred to by the graphic element, and give the JPG entity a notation processor hint. The markup in the document is straightforward to parse by eye, but as an exercise you might see if you can spot the empty elements from their start-tags (there are two of these).

This example may need correction when the final draft of XML is released. However it seems clear that both HTML and SGML documents will need amending to conform with XML (even with its more liberal notion of being 'well-formed' rather than its stronger concept of validity in accordance with an XML DTD). HTML documents will need at the least end-tags adding. SGML DTDs may need more or less re-writing, since XML outlaws some commonly used syntax of SGML (the & connector in content models; element inclusions and exclusions; and parameter entities). I have a sneaking suspicion that many people will be looking long and hard at the compliance criteria for well-formed XML documents.

It's possible to look away from the small print of the XML proposal to the larger picture of real world documents perhaps sceptical of the changes being asked for. Arguably though XML is the best attempt yet to move on from so-called plain text as the lowest common denominator for document interchange. To let loose with the millennial tendencies I mentioned earlier, I can imagine an XML document editor which lets you create your document's structure by connecting boxes in a design workspace, and then writes it out as an XML DTD along with your document and the rendering instructions as a CSS1 style sheet. And somewhere in my mind's dark recesses I recall that Microsoft Word is based on an implicit structured outline model of documents; what price Word 9 or 10 coming XML-enabled with a DTD to cover all documents ever produced by versions 1 through 8?

Adrian Orlowski is an SGML implementer, ex-systems programmer, and ex-ex-journalist. He can be reached at adrian@solero.force9.net.



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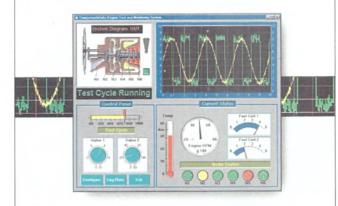
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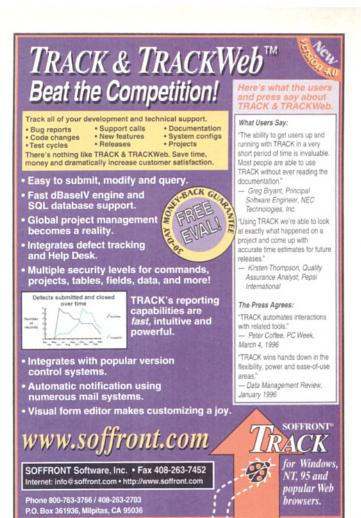
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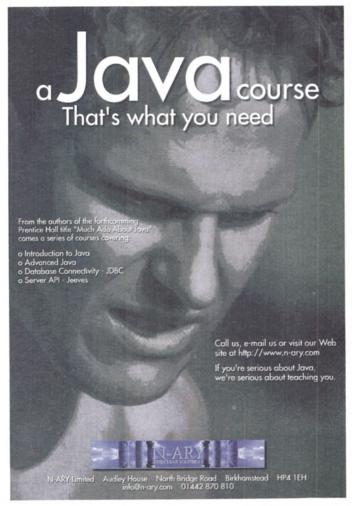
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Canterbury Trails

Follow Peter Collinson through Canterbury - or how to add support for maps on your Web site.

seem to have a bunch of on-going projects at the moment. Much of my own work ends up as background tasks that I return to when (and if) I ever get the time. If you are a regular reader of this column, then you will perhaps have noticed that I generally try to identify whether someone else has already implemented all or part of some functionality I need for a particular piece of work. Sometimes, a search of the Net will turn up good quality usable parts that actually compile and are sufficiently documented to be accessible.

Actually, I feel that searching the Net for software parts can take hours longer than it should. You need to find the appropriate keyword to make any headway, and quite often, that keyword is elusive. Assuming you have some clue as to what the package name is, you can often use Archie to find the master site, but these days, I find that Archie has been nuked by Linux. If you look for a specific package, you'll find zillions of copies of the Linux port, residing on many machines across the world. The Linux undergrowth obscures the single tree that is the master site, making it hard or impossible to find.

I think that people who port software should make an effort to explain the origins of the code they are porting, perhaps putting the information in a clearly identifiable file. A lot of the time, the originators of some software don't put their master site address in the README or INSTALL file, because it doesn't occur to them. So anyone porting and publishing that software should be careful not only to attribute the original authors, but also to tell users where to find the original.

For my own benefit, I now try to remember to create a file called something like ORIGINALFTP in my source tree that tells me where I pulled a particular tar or zip file. Creating this file is easy at the time you are pulling the code. Finding the site again a year or so later can cost a lot of time.

The end result is that using the various search engines on the Web is becoming the only way to find software, and this can mean a time-consuming visual scan of the 20 or so pages that match your search string. Serendipity can uncover some gems, but mostly you have to wade through many references to pages that aren't exactly 100% relevant. Okay, okay. Most search engines have 'advanced search options', but every engine seems to use a different criteria and syntax, and there is a danger that you are actually filtering out the exact index to the page that you need.



Maps and GIFs

I've been thinking for some time about how to improve access to maps on my Web-based Canterbury Tour. Maps on the Web are a problem for us in the UK. Most maps that you buy or see in publications originate at some point from the Ordnance Survey. In the USA, where the fruits of the people's tax dollars are usable by the people, official maps are easily available. Here they are not. The fruits of the tax pounds that have been paid to the Ordnance Survey since 1791, however, are firmly copyrighted by an organisation that now depends on their licence fees to exist. I am told that they are deeply unhappy about the Internet, fearing that their work will disappear for free.

To avoid depending on OS copyright, the map of Canterbury on my Web site is based on the 1908 map of Canterbury. I copied it in the local library, scanned it, and put it into Corel PhotoPaint to generate the map by tracing. There are obviously some new bits of the city: parts of Can-

Time to solve the year 2000 problem

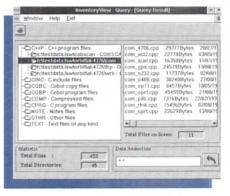
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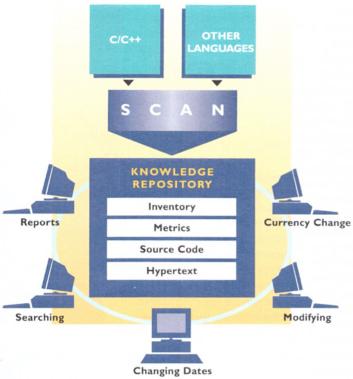
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CANTERBURY TRAILS TECHNIQUES

terbury were flattened in WWII; and there are several new main roads that have been added in the last 20 years. Interestingly, the new road patterns have mostly followed identifiable lines on the map so putting them in is not too hard. Also, there are one or two new housing estates that I walked through to generate the road pattern. It took me about a week or so to get a map that I was happy with, some of which was definitely spent fighting with Corel's product.

The current map is 542x513 pixels and represents a roughly four-mile square of land. Unfortunately, you simply can not get a great deal of useful information into a bitmap of this size. I found that attempting to add road names was difficult because there are no really nice looking fonts that work at tiny resolution. Truetype fonts are fine except when you get down to small sizes, where 'old-fashioned' bitmap fonts do better. The current map is fine for clicking and pointing (even though it's not too accurate), but I'd like to provide a more detailed map, or perhaps a segment of a map with each of the 350 pages that comprise my Canterbury Tour. A zoomed-in more detailed map would also allow me to show street names and perhaps insert the

points where my photos were taken.

I want a map that's perhaps four times the current resolution, but then this would not fit easily in many people's screens. It's trendy to think that I could write a Java applet that scrolled the image. In fact, this was my first thought at solving the problem, and a Java map browser seemed like a viable project that would give me something 'real' to do in Java. In the end, I discarded the idea for reasons of size: a map of the desired resolution is going to be a hefty object. Even the monochrome bitmap that I scanned and fed into Corel PhotoPaint is about 250,000 bytes as a GIF. To be fair, it covers a larger area and has more detail than I need, so a real traced map will be smaller. For comparison, my current map is about 28,000 bytes, it benefits from the compression used in GIF images, which compacts areas of the same colour. However, a large map that is four times the current size will be a big file, and any Java applet would need to pull this huge bitmap over the Net. The transmission time would be unacceptably slow.

An alternative idea is to pull smaller bitmaps over as they are needed. The high-density, high-volume map could be split into sections and transferred on demand. If I am going to do this, then the scrolling Java screen manager will not be needed. The sledgehammer approach is to split the map up into tiny chunks on disk and ship them to the user's browser one piece at a time. A nicer idea would be to generate the picture dynamically. Here, some Web serendipity came into play.

The GD library

Thomas Boutell's Web site (look for URLs at the end of this article) is home to his GD library. I'd originally found the library when pulling his imagemap creation program, Mapedit. This was one of the first WYSIWYG programs where you could trace over an image to obtain the co-ordinates that you need for making image maps on the Web.

The GD library provides an easy-to-use set of C routines designed to output GIF images (GD stands for GIFDraw). There are routines $\frac{1}{2}$

that can manipulate stored images from files, draw lines, output text, construct polygons and filled areas, and output the result as a GIF.

The library encapsulates the image being manipulated in a single gdImage structure, accessed via the library functions (some of which are actually macros). GD manages its own data areas, so a gdImage structure is allocated when one of the create routines is called. When you are done with an image, you should free its associated data areas by calling a clean-up rou-

tine: gdImageDestroy.

You can create an internal image from scratch by supplying a size or pull an existing image from a file, in GIF, X-bitmap or GD formats. (A note: the programmer has to know what the file contains and call the appropriate GD routine.) GD format files are intended to speed up the loading of images - reading GIF files can be slow because of the LZW compression employed. If you are using the GD library to create GIFs on the fly based on other images, then you really want to store the working images in uncompressed form so you can pull them into the program quickly. To this end, GD files are exploded GIF files. The GD package comes with a program that will convert GIFS to GD images.

The X-bitmap reading function is only there for convenience, betraying the Unix development origin of the GD library: you can only output images in GIF or GD format.

Creating images

The sledgehammer

approach is to split the

map up into tiny chunks

on disk and ship them

to the user's browser

one piece at a time.

GIF format employs a colour map of 256 colours, indexed by the actual pixel values in the image. (Note: by default, the zeroth entry in the map is the background colour of the image). All the routines that change the image take a colour map index as a parameter. So drawing becomes a two-stage operation: first a colour map value is allocated (with gdImageColorAllocate), and then the drawing operation is performed. The gdImageColorAllocate routine doesn't check to see if a particular colour has already been allocated, so you need to keep track of this yourself, or use the search routine gdImageColorExact before you allocate a new map entry.

Things get harder when the map fills up, and you need to allocate a colour that doesn't exist, (which can happen easily if you are processing a photograph). The routine gdImageColorClosest searches the map to find whichever entry is closest to the desired colour. Closest means the Euclidean distance: it treats the colour space as a three-dimensional address space and uses the co-ordinate equation of a sphere to find the nearest value.

GD supplies a full set of primitive drawing functions: you can paint single pixels, and draw lines, rectangles, arcs and polygons. Closed figures can be drawn as filled objects, and there are a couple of flood fill functions. The first moves over the image painting onto adjacent pixels of the same colour as the starting point. The second takes a colour parameter to specify a border colour where the flood fill will stop.

It's convenient to be able to supply a drawing style so that you can set up an arbitrary dashed or dotted line and simply call the standard drawing routines to place the line on the image, and this is done by

EXE june 1997

TECHNIQUES CANTERBURY TRAILS

establishing a vector of colour map indexes. You can set elements of the vector to a 'magic' value, to make that point in the pattern transparent. Each gdImage has a 'current' drawing style set by calling gdImageSetStyle with your vector. You then select the current style for a drawing routine by supplying the magic number gdStyled in place of the regular colour map index.

You can use any GD image to tile an image that you are creating. The tile can also be used in an area fill by supplying a magic value gdTiled as the colour index to the particular flood fill function. Tiles can have 'holes' where you want the background image to show through, this is done by setting the transparent colour indicator in the image being used for tiling to the colour index of the holes.

An image can also be used as a 'brush' when lines are drawn.
Like a tiled image, the brush image can contain holes by using the transparent colour setting on the brush bitmap.
Once a brush is loaded, it can be used in any line drawing routine.
The images will overlap unless a style is used to specify a 'dotted' line

Unlike many other drawing packages that I've found on the Web, GD provides some character drawing functions, even if they are (perhaps) a little rudimentary. Characters are taken from five internal bitmap fonts whose names are close to the standard sizes for T-shirts: tiny, small, medium-bold, large and giant, all with a fixed style. Characters can be drawn singly or in strings, and can be placed going across or up the image. The characters are fine for labelling diagrams, but it would be good to see this area of the package improved. I did wonder about implementing some code that that would read TrueType fonts, but since the GD package has no anti-aliasing, it makes sense to use bitmap fonts rather than expecting to be able to draw good-looking curved lines. Of course, other letter styles can be picked up and used from bitmaps.

The GD library provides a number of routines to copy images or parts of images. There's an arbitrary copying function that will copy a region from one image to another. If you are copying within the same image, the code will work unless the regions overlap. You can also copy and change the size of an image. On the lower level, there are various query functions for accessing and querying the gdImage structure and its associated image.

Odds and ends

The GD library is purported to compile and be usable on a great number of platforms, not just the Unix systems where it started. I found it worked fine and compiled with some minor header changes on my Solaris and BSDI machines. I didn't pluck up enough courage to try on my NT or Windows machines.

I've had the library for some time, with the aim of using it in my mapping application (eventually). I recently returned to Boutell's Web site, wondering if someone had done a 3D library that would work with the standard 2D gd primitives. I could not find any 3D library, but discovered that Boutell's Web site contained a pointer to a site in

Australia hosting a program that allows text based input to the gd library. The program is called ${\tt fly}$ (because it creates GIFs on the fly), and is written by Martin Gleeson. It's a simple program that takes commands from its standard input, translates them directly into gd calls, outputting a GIF at the end of the day. The program allows you to quickly prototype gd applications using a shell or Perl. It's a good tool for exploring the GD package.

The fly program does have some pitfalls and it can mysteriously hang. This is due to some problems with the way that it reads

tokens: it doesn't understand that tabs should behave like whitespace, and tends not to allow spaces in lists of numbers. If you closely follow the format of the examples, however, then it works OK.

There's another interpreter for the GD library called tgd written by Bradley K. Sherman, which looks somewhat better than fly, but I have not played with it. There are apparently Perl and Tcl interfaces to GD as well, although some of these links from Boutell's page seemed broken when I tried to investigate them.

Incidentally, remember that the LZW compression method employed by the GIF format has been patented by Unisys, and some applications will require

royalties to be paid. This is why the PNG (Portable Network Graphic format, or PNG's Not GIF, depending on your tastes) graphic format has been developed (see *Patent grief in GIF city* in EXE May 1995). PNG promises better performance on the Web because of smaller file sizes, and inline support for the format is supposed to be forthcoming in the major browsers (see *A PNG format primer* in EXE August 1995). According to Boutell's Web site, GD will support PNG in release 2.0.

The GD library is

purported to compile and

be usable on a great

number of platforms, not

just the Unix systems

where it started.

The atlas method

Well, I've only just begun the process of building the big map that I need to provide the basis of the derived maps for the Canterbury Tour. Technically, however, I can see the way forward. The map will need to be stored as a GD format file, otherwise loading the whole image will be time consuming. I can load the file, copy a fixed sized region creating a new image, perhaps overlay it with some markings to show the positions where the photographs were taken, and deliver it to the user. I suspect that the user will expect the map to be clickable and that presents another set of problems.

In the meantime, I've been wondering about using the GD routines to deliver better looking bar charts on my Web statistics page. Yet another background project on my list, sigh.

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

Thomas Boutell's Web site is http://www.boutell.com. It's worth a visit, there are several nice things there. The fly program can be found at http://www.unimelb.edu.au/fly/fly.html. The tgd interpreter is at http://s27w007.pswfs.gov/tgd/. The URL of the Ordnance Survey is http://www.ordsvy.gov.uk.

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To serve or not to serve; that is the servlet

Whether 'tis nobler on the client, you can now put Java functionality on the server, as Alan Williamson explains.

p to now, Java has been very much associated with the client side of the client-server equation, sprouting up in applets and beans of various kinds. The server side has been relatively untouched. In fact, for a while it was looking as if the Java community had forgotten all about the server, hell bent on taking over the world with applets. But now, that is about to change, the Java Server API has arrived, and world domination is around the corner! Okay, maybe that's a little bit overzealous, but the server API is going to have an enormous impact on the Web community.

The Server API

The term 'Server API' is in actual fact the collective name for two sets of APIs. The first one is the server API. This is a framework of classes that allow easy construction of connection-orientated server side applications. The second is a set of classes for building servlets, small programs that run in response to client connection or requests. The server API facilitates the process of connecting to the client, and once a connection has been established, hands over the processing to a servlet.

Servlets are to the server what applets are to the client. They extend the functionality offered by the server, just as applets enrich the browser environment. I'm going to concentrate on the servlet API, and demonstrate the advantages it has over existing technologies like CGI.

To demonstrate the power of the server API, JavaSoft has developed a commercial Java-based Web server, codenamed Jeeves, which supports the full range of features found in mainstream servers, with the addition of servlet execution. Fortunately, Jeeves is not the only Web server that supports servlets: at the time of writing, Apache, Netscape and Microsoft are about to release extensions to their servers to support servlets.

(Note: the term 'servlets' is not unique to JavaSoft's implementation. Netscape has its own server API very similar to JavaSoft's offering. However – although it too is Java-based – it is only supported by Netscape's Web and Enterprise servers, and no other vendors have announced plans to support it).

A better CGI?

The CGI (Common Gateway Interface) standard is a set of rules governing the collection and passing of data to back end programs. It has proven well suited to the Web community, and is used widely for dynamically generating Web pages, implementing hit counters and the like. There are a number of disadvantages to using the standard in this way, however. Every time a CGI script is called, the server must create a new program instance, load the code, allocate memory and execute the program, passing its output back to the client. This over-



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Figure 1 - The architecture of a servlet.

head takes up a finite amount of time, and with hundreds or possibly even thousands of simultaneous requests, the system can get clogged up with processes very quickly.

Servlets on the other hand, operate differently. When a client connection comes in, the servlet is loaded and run. However, when it has finished executing, the servlet is not removed: subsequent requests are handled with a single method call. Servlets can handle multiple requests because of Java's multithreading environment. The server maintains a pool of threads, and allocates a thread of execution to each client request that comes in. If a thread is not available, then the client blocks until one becomes free. The server never becomes consumed with processes, since a fixed number of threads is set by the administrator. The need to continually reload, and initialise programs is completely eliminated, using a 'load-once, run-many' policy.

To be fair to the CGI community, they had foreseen this short-coming long before servlets came along, and came up with a new standard called FastCGI. This standard insists on CGI programs being written in C (to ensure the fastest possible execution speed), and instead of the server loading separate programs every time a request comes in, it caches them in memory. Although it significantly improves CGI performance, FastCGI is still less attractive than a servlet-based solution.

Because CGI is just a set of language-independent rules about how to move data from one point to another, it has no standard libraries or methods as such. Consequently, CGI scripts rely heavily on other programs for the majority of their functionality. When processing an HTML form, for example, the most common action taken is to send the data to some email account. To do this, the CGI script must package the data into a file, and then call upon some external mail program to do the actual sending. The server not only has to load and initialise the CGI script itself, but has to load another program as well, and 1000 client connections means 2000 processes.

Another area of hot debate is the portability of CGI. In theory, many CGI scripts should be very portable between platforms. However, if a script relies on external system-dependent software, like the 'sendmail' program (the standard Unix mailer), then that program must be available on every platform the script is run on, with exactly the same operational characteristics.

Servlets overcome both of these problems. Since they are implemented in Java, they have access to Java's rich (and getting richer) set of standard libraries, so the majority of tasks can be done entirely within the Java environment, and require no assistance from any other program. Plus, if everything is written in Java, porting is no longer an issue: a servlet can be written once and run on any platform that supports the Java environment. Table 1 summarises the differences between servlets and CGI for processing client requests.

Hello World

Now that you have seen why you should be using servlets, lets take a look at how you do it, and the class hierarchy of the servlet API.

All servlets are derived from <code>GenericServlet</code>, from the <code>java.servlet</code> package. This class defines all the functionality required in processing a client connection. To demonstrate its usage,

take a look at Listing 1, which shows the most famous program in the world, 'Hello World'.

The servlet has two methods, $\mathtt{init}()$ and $\mathtt{service}()$. The $\mathtt{init}()$ method is called once when the servlet is initialised, and is where it can perform global variable initialisation (or if it will have state changes, the loading of configuration files). Note, though, that it is not compulsory to override $\mathtt{init}()$.

The service() method is where all the work is performed, and it is called by the server for each client connection that is accepted (a lot more efficient than loading and initialising a CGI program).

A servlet communicates with the outside world through its input and output streams. Data from the client (for example, the data generated by a form posting) is passed to the input stream, and the output stream is the data that is sent back to the client, usually for display in a browser. The servlet API defines two classes to support this mechanism, <code>ServletRequest</code> and <code>ServletResponse</code>.

Those of you familiar with the Java environment will know all input and output is performed using stream classes, not unlike the streams used in C++.

With references to both streams, you can use any of the standard stream handlers for communication. In Listing 1, we constructed a PrintStream to give us a very easy means of sending strings to the client. We then wrote a simple HTML page to the stream, with the words 'Hello World!' embedded in it.

This, although not exactly rocket science, at least demonstrates how servlets can create dynamic HTML pages. This servlet is referenced just like any other resource on the Internet; through the use of a URL. For example, this servlet can have an alias set up to it, which would result in being accessed using a URL of the forum: http://www.n-ary.com/helloworld.html.

Next, we'll look at a more realistic problem: a hit counter.

Over the counter

One of the most common applications of server side processing (aside from HTML forms that is), is a hit counter, which totals the number of times a particular page is accessed. This is usually implemented with CGI, which can be a source of frustration to the user: it is not uncommon for the loading of the page to hang, waiting for the CGI script to finish. Servlets can provide a simple and efficient alternative.

Description	CGI	Servlets
Serve client requests	V	V
Execute third party software	V	V
Rely on third party software	V	X
Client request = separate program instance	V	×
Can it consume servers resources	V	X
Support Server Side Includes	V	V
Efficient for many concurrent users	X	V
100 % portable across platforms	X	V
Single standard library	X	V
Rich in security features	×	V

Table 1 - Comparing CGI and servlets.

TECHNIQUES TO SERVE OR NOT TO SERVE

Listing 2, shows a very basic counter servlet, which overrides the <code>init()</code> method to reset the <code>NoTimes</code> counter variable on initialisation. Each time the <code>service()</code> method is called, the counter is incremented, then converted into a string and sent to the client.

The servlet is called (or referred from the client) through the use of the <code><SERVLET></code> tag, which instructs the server, to run the referenced servlet, and insert its output into the current position of the file that is being sent to the client. This is known as server-side include.

```
<SERVLET NAME="counter" CODE="CounterServlet">
```

By default, a servlet is loaded once and remains in memory until the server is restarted, but servlets can be loaded and unloaded on demand via the NAME attribute. A servlet which has been given a logical or symbolic name will be kept in memory after its service() method terminates, but an anonymous servlet is unloaded after its execution has finiahed.

Future of the server

With the current bandwidth constraints on the Internet, common sense dictates that the amount of data being sent to the client should

```
import java.servlet.*;
import java.io.*;
public class HelloWorldServlet extends GenericServlet
  public void init() ()
  public void service ( ServletRequest _Req,
                        ServletResponse _Res
                        throws IOExeception
     Res.setContentType( "text/html" );
    PrintStream Output = new PrintStream(
      _Res.getOutputStream() );
    Output.println( "<HTML> <HEAD> <TITLE>
      Hello World</TITLE> <HEAD>");
    Output.println( "<BODY>" );
    Output.println( "<H1> HELLO WORLD! </H1>" );
    Output.println( "</BODY> </HTML>" );
    Output.flush();
```

Listing 1 - A 'hello world' servlet.

Listing 2 - A hit counter servlet.

be kept to a minimum. For this reason, Java applets are not an ideal solution to many problems, since they must pull all the data they need over the network, as well as their code. Not only does this introduce an unnecessary waiting factor, but tugs at the patience of the user. How many times have you sat looking at a grey rectangle, waiting for an applet to load and begin execution? Not only that, but applets are growing in size, with the average applet size ranging from anywhere between 10 KB to 200 KB. This, in today's Internet environment, is unacceptable to the majority of users. HTML is fast because the actual data transferred is very small, and pages can be constructed as and when the data starts arriving – you don't have to wait until everything has loaded, as is frequently the case with applets.

The reason the growth in applets took place, was to increase the functionality at the client side, while reducing the load at the server end. While this is a good idea in many situations, it is not a universal panacaea: many applications will be better served with a servlet implementation instead of an applet.

Areas that can benefit from a redesign include database front-ending. Typical solutions have involved a Java applet talking to a CGI script or custom server application to retrieve data from the database. This solution is fraught with problems: no section of the application, for example, can withstand a change in another section. If the database where to be replaced with a much bigger system, the CGI scripts would need to be redeveloped. This has a knock on effect to the Java applet that is front-ending the whole system.

In the past, a total-Java solution has not been practical: there still had to be something to take the client request and pass it on to the database. With mature Java technology like JDBC (Java Database Connectivity) now available, however, servlets can do everything they need to do.

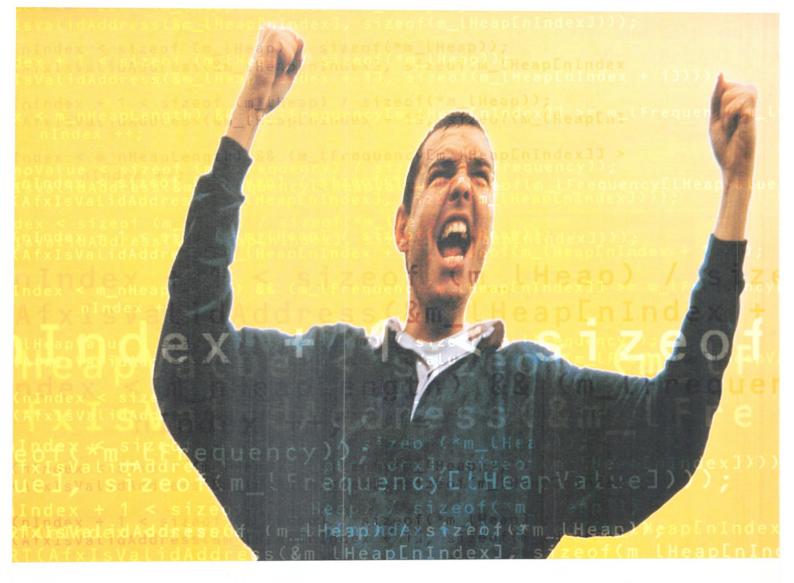
With JDBC, a servlet can access a generic interface to the database without worrying about the actual details of the connection. This is the responsibility of the vendor-supplied JDBC driver. By employing this technique, the database can be switched in and out without replacing or recompiling any code elsewhere in the solution. The servlet can either send the data back to an applet to display, or alternatively create dynamic HTML pages that not only load quicker but are faster to process.

On a smaller scale, servlets can be employed everywhere CGI solutions where implemented, in search engines, page counters, HTML filters, or localisation of pages.

Although we have concentrated on servlets and their interaction with Web servers, it is possible to use the server API to create other custom servers, like mail, finger, or date servers. Plus, every custom server can farm out appropriate sections of its processing to servlets.

Looking at the past history of Java, it won't take long before we start seeing servlets replacing CGI scripts. You can now develop custom server-side applications without worrying about the internal details of each platform, and in many cases get a performance boost for free.

Alan Williamson is managing director of N-ARY Limited, a UK company which specialises in providing 100% Java solutions. He co-authored Java Database Programming: Servlets & JDBC, wrote Special Edition: Java Server API, and is a regular columnist for the Java Development Journal, as well as being on the judging panel for the Java Rating Service (JARS).



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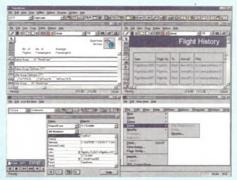




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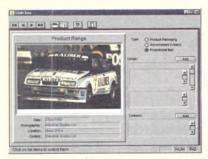
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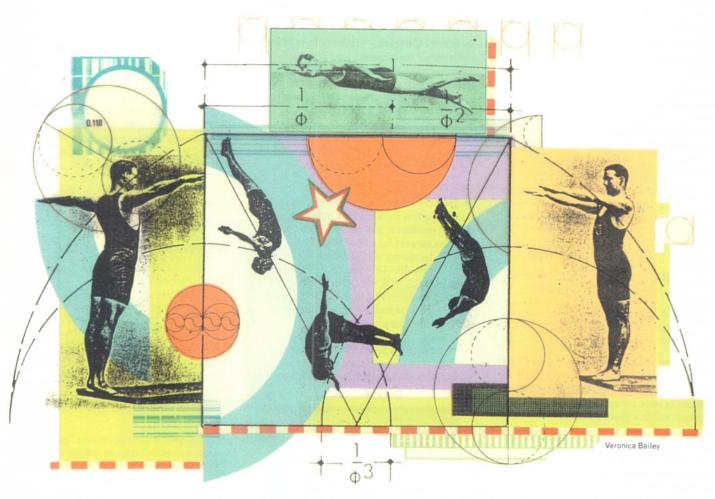
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Getting the bends

In the final part of his in-depth series, Jules May gets rational with B-splines, and introduces NURBS for modelling natural surfaces.



Over the last two issues, we've looked at several classes of spline, including Hermite and Bézier curves, which have gained wide application in areas like animation path modelling and font design. Flexible though these forms are, the animation and games industries have seen widespread adoption of another type of spline suited for modelling organic shapes, with the interesting title of NURBS.

We ended last month with a description of the conditions required to join two Bézier spline segments such that the joint was C(2) continuous. As you will recall, fiddling with the control points to enforce the continuity was too difficult for a user to control reliably. There is an easier approach, though, and we'll conclude our series on splines with it.

Figure 1 shows the same construction, but this time using a t-v graph. For C(2) continuity, we require that the subsidiary point d, marked with a cross in Figure 1, exists and is unique. If we assume that d does indeed exist, we can give the user control over it. We can create a polygon $\{d\}$ made up of a number of such ds, calculate the Bézier control points from them, and then draw the spline as a Bézier. Such a spline is called a B-Spline.

If should be clear from Figure 1 that, in general, the curve never passes through the control points $\{d\}$. This means that this approach is an approximator, rather than an interpolator (see EXE, April 97). Also, since Béziers have a convex hull property, and the Béziers lie inside the convex hull of the B-Spline polygon, B-Splines have the convex hull property as well. There's something rather more important to note, though; you can see that the red dot in Figure 1 (which is a Bézier endpoint, and is therefore interpolated) does not have the same time value as the point d which gave rise to it. (In fact, the two times will be identical in the special case where the knot sequence is uniform, but we'll work with the general case here. Recall a uniform spline is one where all the knot spacings are the same). That means we have to choose, when selecting knot sequences, whether we specify the times of the control vertices or of the joints. Conventionally, we use the times of the joints.

Starting with a sequence of ds, how do you find the Bézier control points? First, use the times of the joints to find the times of the intermediate points, then find the v values of the intermediate points (by

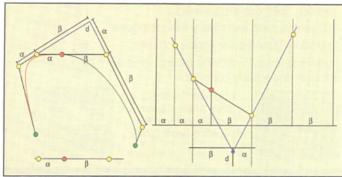


Figure 1 - Rules for C(2) continuity.

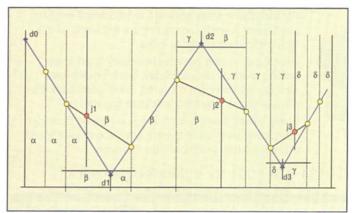


Figure 2 - Finding the times of the control vertices.

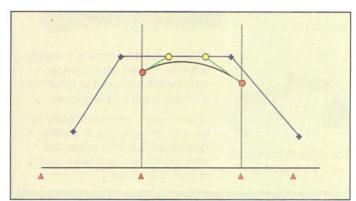


Figure 3 – An internal segment. Note how the uneven knot spacing has pulled the segment to one side.

interpolating the original edges), then you'd find the v values of the joints (by interpolating the intermediate points).

What if we want to work out the times of the control points? Figure 2 shows the approach to take. Suppose we're finding the time of d_2 . We know that j_2 is $d_2-\gamma+\beta$, and that j_1 is $j_2-3\beta=d_2-\gamma-2\beta$, and j_3 is $j_2+3\gamma=d_2+2\gamma+\beta$. Averaging these gives us d_2 .

You can see from Figure 2 that we need to be able to find the times of all the control points. Imagine that d_{ϱ} moves in time; the position of j_{1} , and therefore the shape of the curve, will clearly change. However, as we've seen, in order to find the time of d_{ϱ} , we need the knots for j_{ϱ} and j_{-1} , but those joints don't exist. In order to create these, we have to provide (or invent) an extra two knots to start the sequence off. A similar reasoning applies to the end of the sequence.

We're now ready to state some general results. For a uniform or non-uniform spline, we need a control polygon made up of i control vertices, called \mathbf{d}_0 to \mathbf{d}_{l-l} . If the spline is of order N (for a cubic, N=3,

and so on), then we need N+i-1 knots as well, called \mathbf{t}_0 to \mathbf{t}_{N+i-2} . Notice that the knots don't relate directly to the control vertices any more; in order to find the time of \mathbf{d}_n we calculate the average of N knots, with the expression:

$$\sum_{k=n}^{n+N-1} t_k / N$$

Every edge of the control polygon will give rise to one polynomial spline segment, and the joints will be C(N-1) continuous.

Let's now look at some interesting special cases. Firstly, what happens to a segment in the interior of a sequence? Figure 3 shows a cubic spline. In order to simplify the t-v graph, we're going to represent the knots as triangles. The curve closely follows the shape of the control polygon, but doesn't quite meet it. This is the general shape of interior segments. Figure 4 shows another case: the effect on the end of a sequence when the knots are approximately uniformly spaced. The curve approaches the last point, but doesn't quite meet it. In fact, in this case we've faked an end condition, which is what the dotted line represents. If we wanted the curve to be cyclic, we'd use this end condition to join up with the other end.

The final special case we're going to consider is what happens when the knots are repeated. We'll take the simplest case we can; four segments, with all the knots repeated. In Figure 5, on the left, we have an image which shows what happens when the knots are very close, and on the right, what happens when they're identical. Note that the times of the control points are now forced to be equally spaced, because the times are made from an average of three knots. The image on the right should be very familiar by now: the B-Spline has turned into a Bézier!

Computing B-Splines

Though we've approached B-Splines by turning them into Béziers, this is not the best way to calculate them. Our standard three methods for calculating splines (stepping along the line, calculating the polynomials directly, and cracking), however, are all applicable to B-Splines.

For the first two, we need to know the basis functions, so we can find the actual polynomials to be evaluated. The basis functions change depending on the knot spacing, so (unless we're limiting ourselves to uniform splines) we'll have to recalculate the basis on the fly.

Consider, first, a completely discontinuous spline – that is, one that sticks to a control point for a while, then leaps to the next control point. Figure 6a shows the basis functions for one interval, and the following interval. If we wanted to linearly interpolate from one vertex to the next, we would need to combine these two using ramp functions; we'd multiply each basis function by its own ramp (shown dotted), and add the results together. This would give the basis shown by the blue line in Figure 6b. Now, to get a quadratic basis, we'd need to blend two linears in the same way, and to get a cubic, we need to blend two quadratics.

You can see that for a basis function of order n, n+1 intervals are affected. That means, therefore, that if you were to evaluate a cubic segment, we'd need to find four different basis functions, multiply them by the control vertex positions, and then add them together to find the final polynomial.

Changing uniforms

Cracking a uniform spline in the conventional manner is relatively simple. Divide each edge into four, construct the red lines as shown in Figure 7, then join the middles of the original edges to the middles of the red lines. Again, the blue line shows the original polygon, and the black



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Govt and Large PLC's - official PO's welcome. All Trademarks are acknowledged! All prices specifications and offers remain subject to change without notice. line shows the cracked version. You can see that none of the original vertices remain, and it's important that you perform this operation over the entire length of the polygon; you can't do it here and there.

Cracking a non-uniform B-Spline is slightly trickier to accomplish than the other splines we've seen. In order to handle it, we have to explore

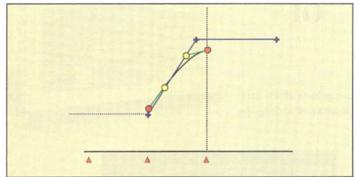


Figure 4 - End of case for repeated knots.

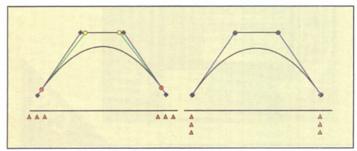


Figure 5 - End case for repeated knots.

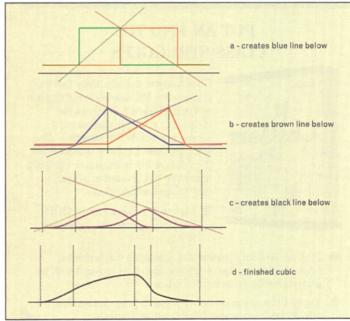


Figure 6 - Construction of the B-spline basis functions.

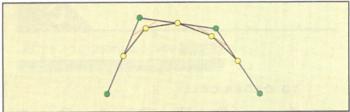


Figure 7 - Cracking a uniform B-spline.

a related concept: *knot insertion*. The principle is that we can take a spline, along with its knot sequence, and add another knot to the sequence, adjusting the control vertices so that the new polygon describes exactly the same curve as the original.

Because the order of the spline hasn't changed, we will need to create a new polygon with one extra vertex. Some of the existing vertices will have to move in order to make space for the new one. Consider Figure 8: you can see the time line, and the knots marked out on it in red. Above the time line



are the times of the vertices (recall, the time of each vertex is the average of the times of three knots). Now, when we add the extra knot (shown by the taller triangle), two of the vertex points become invalid (marked with crosses), and three new ones (the tall triangles) appear.

The two vertices which have been deleted must, of course, be removed from the polygon, and we need to invent new polygon vertices corresponding to the vertices created by the new knot. This is done by simple linear interpolation, as shown in the picture. The blue line represents the original polygon, and the black line represents the new polygon after the knot has been inserted.

This algorithm allows us to insert knots one at a time. We can perform a conventional crack by inserting new knots between every pair of existing knots, which will double the number of spline segments in the polygon. (Proceed from right to left along the sequence, making the adjustments as you go). But we can be more clever: if we're looking for a polygon where the vertices are roughly equally spaced in time or are about one pixel apart, we can insert knots only into the longer intervals. We can, in effect, refine the polygon only in the areas we're interested in.

But, there's an interesting point to note. We've already seen how several knots can have the same value when they're at the end of a polygon, but interior knots can be multiple as well. A little experimentation will convince you that, for a cubic spline, once you've inserted three knots, nothing happens if you insert any more. You get some new vertices, but they're in exactly the same place as the old ones. Just as we saw in the end condition, when you have three or more knots together, the spline curve interpolates the vertex. This gives us an interesting construction to evaluate the value of the cubic at some time t – simply keep inserting knots at t until we've got four of them, then read off the value of the corresponding vertex.

Even more interesting is that you don't need to insert the knots to perform the calculation! Every time you insert a knot, you can tell in advance which vertices are going to be destroyed, and where the new ones are going to show up. This gives the geometrical construction shown in Figure 9. The three time lines show the first, second, and third insertion of the new knot, and the x-y graph on the left shows what happens geometrically. Again, crosses show which vertices are deleted.

The fact that we can do this shows something else interesting as well. We can take any spline, and turn it into a spline which interpolates an internal point. We can therefore split the polygon at this point, making two independent segments, both of which interpolate their end point – another way of cracking the spline.

Rational splines and NURBS

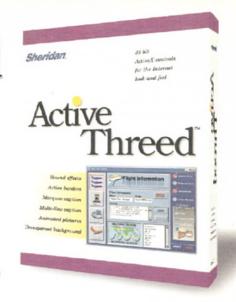
Up until now, all the curves we've been discussing have been polynomials – quadratics, quartics, linears, and (mostly) cubics. Cubics are very good, but they always represent the same kind of lines. Occasionally, we will want to handle lines which are not cubic in form –

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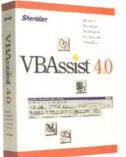






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and if we try to show a cubic line in perspective it ceases to be cubic – so we need to find a more general form yet. NURBS (which stands for Non-Uniform Rational B-Spline) are the approach we'll explore here, though we can turn any spline algorithm into a rational version.

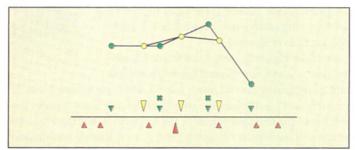


Figure 8 - Knot insertion.

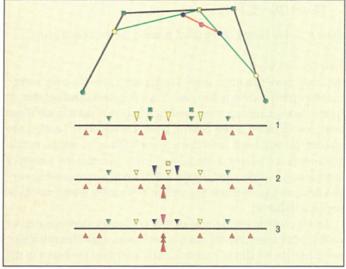


Figure 9 - Geometric construction of a spline point.

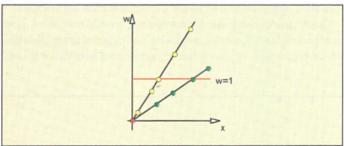


Figure 10 - Homogeneous co-ordinates.

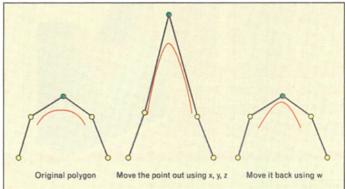


Figure 11 - How weight affects a B-spline curve.

The key to this approach is hinted by the mention of perspective. Perspective calculations are frequently done with a special form of co-ordinates, called homogeneous co-ordinates. Let us suppose that the v which we have been drawing in the t-v graphs for is three-dimensional, ie it comprises a three valued vector $\{x, y, z\}$. If we were to write this in a three-dimensional form, we would add a fourth number to the sequence, turning it into $\{x', y', z', w\}$. To turn this back into a three-dimensional vector, we divide each of the first



three by w, so the actual three-dimensional point being defined is $\{x'/w, y'/w, z'/w, w\}$. We call w the weight of the v.

It's probably easiest to understand what's going on with the aid of a picture. In Figure 10, we have several one-dimensional homogeneous points. All the yellow points lie on a single line, and where the line crosses the w=1 line we can read off the real one-dimensional point which the yellow points correspond to – that's where $\{x',y',z',w'\} = \{x,y,z\}$. Similarly, all the green points lie on a single line, so work out to the same real point where their line crosses w=1. In a sense, w represents how far away the point is from where we are, and so makes the 'image' of the point smaller with increasing distance. Notice the red point: that lies on both lines, so we can't tell what the real point is (if we try to work it out, we'll be dividing by zero).

How does this relate to splines? Recall that, when we're making a spline, we create a function for each co-ordinate in v; we could write this as x = x(t), y = y(t), z = z(t), and that each of these functions is cubic. If we introduced a fourth function, w = w(t) where w(t) is also cubic, then the actual value of x which we need is x = x(t)/w(t), or a cubic divided by a different cubic. (Rational means one thing divided by another).

Imagine we have a polygon as shown in Figure 11, and we make a curve to go with it. Now imagine we increase the weight of the point without changing its real position. If w increases three-fold, the x,y, and z values must also increase threefold. With such high values, the modified point will clearly exert an enormous influence on the shape of the curve — in this case, three times the influence. But the position hasn't changed, because the increased w value is returning the point to its original real position. In short, the effect of increasing the weight of a single control point is to draw the curve closer to the point at the expense of the neighbouring points, as in Figure 11. Figure 12 shows a different way of looking at the situation: imagine the green control point being pushed away from you. The red line will chase the point, as you'd expect, and so will be curving away from you and receding into the distance.

A little experimenting will convince you that increasing the weight of a point works by increasing the influence of the point being weighted and removing influence from the neighbouring points. If all the points in a region are weighted by the same amount, the shape of the curve isn't affected. You can also see that if the weight of a single point is reduced to 0, the point will have no influence on the shape of the curve whatsoever. Beware; if several points in a region have their weights reduced to 0, none will have any influence over the shape of the curve, and the curve will become undefined (recall the red dot in Figure 10). Finally, good manners requires that no weight is ever negative (it spoils the convex hull property).

Take care when working with rationals. When we change the weight of a point, we're not changing its position at all. The weight of a point is no more the w co-ordinate of the homogeneous point than its x, y, or z are the x, y, and z co-ordinate of the homogeneous point. We need to take the existing x, y, z, and weight of the control point

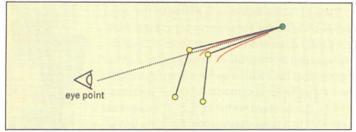


Figure 12 - Another way to look at Figure 11.

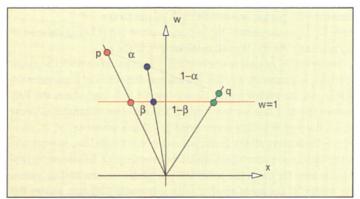


Figure 13 - Rational interpolation.

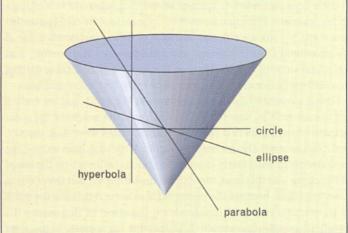
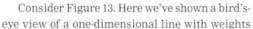


Figure 14 - The four distinct conic sections.

which have been provided by the user, turn them into homogeneous co-ordinates, do the work we need to do, and then turn them back into real points again. This process is particularly important when interpolating along lines, because the continual conversion processes will introduce numerical errors. Instead, it's possible to create a different kind of division, where only the interpolation ratio is adjusted.





built in, defined by the two points p and q, which we want to divide in the ratio $\alpha: 1-\alpha$. Clearly, the weight of the new point divides the weights of the original points in the same ratio, but the real line (where w=1) divides in a different ratio, $\beta: 1-\beta$. How do we calculate β ? A simple exercise in similar triangles gives the result that:

$$\beta = \frac{\alpha \cdot q_w}{(1 - \alpha) \cdot (p_w - q_w) + q_w}$$

where p_w is the weight of the point p, and q_w is the weight of q.

Rational argument

Rationals have two main uses. Firstly, they give the user rather smoother control than is possible with a simple control polygon. If the user is working on a shape, and he wants to make a local refinement, he can insert a new control point. On the other hand, if the new control point is a little more powerful than he wants, he can then reduce the weight of the new point (or increase the weight of another one) in order to adjust the influence. When smoothing sampled data, we can decrease the weight of samples which we think may be unreliable.

Another way to use rational splines is to create curves which we couldn't otherwise make. We can treat any spline algorithm rationally; increasing the weight of a control point sharpens the curve in the region of the control point, and decreasing the weight flattens it. We can use this behaviour in an Aitken's spline to control the sharpness of an interpolated point, and we can do a similar trick with Béziers.

Quadratics in particular are interesting, because they allow us to build conics. Circles, ellipses, parabolas, and hyperbolas are all examples of conics, and all conics can be represented with rational qua-

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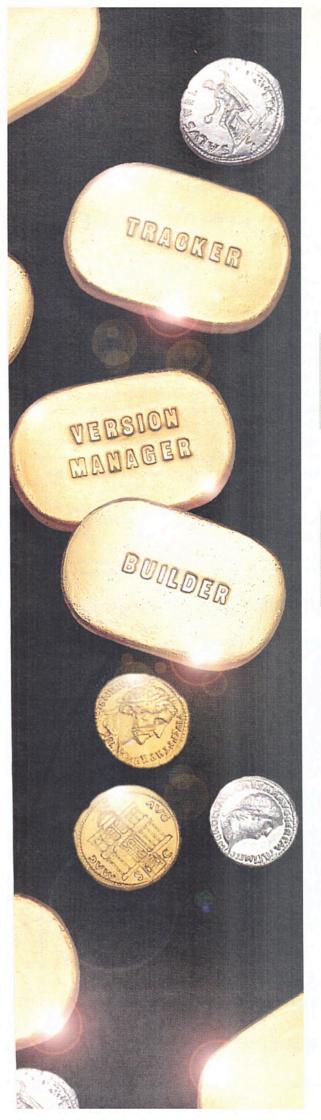
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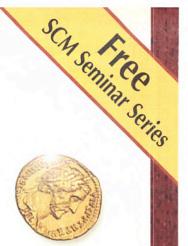
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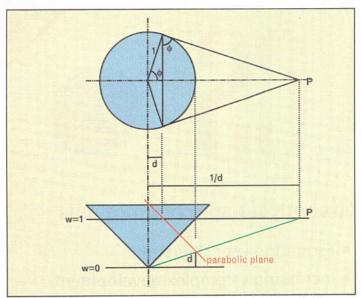


Figure 15 – Calculating the weight of the subsidiary quadratic Bézier point.

dratics. As a point of interest, parabolas are a special case of conics where no divisor is necessary, so parabolas are what are made by normal polynomial quadratics. If we want to make other conics, we have to add in the rational term.

Let's investigate making arcs of a circle using Béziers. Conics get their name because they can all be created by slicing through a cone. Figure 14 shows a cone with several slices. We know that three points interpreted as a quadratic Bézier create a parabola, so if the interpolated points have weights of 1, and the subsidiary point places the plane of the three points parallel to the side of the cone, on the parabolic slicing plane, then the projection of the line back into real space (w=1) will create a circle.

Without loss of generality, we'll assume that the circle slice is at w=1, that the circle it's creating has a radius of 1, and that the parabolic slice intersects the endpoints of the Bézier polygon.

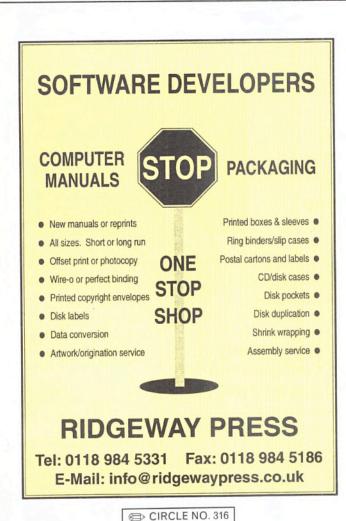


That means that the parabolic plane has an angle of 45° . Referring to Figure 15, we can see that $d=\cos\phi$, and the position of the subsidiary Bézier point P is $1/d=1/\cos\phi$. It all works out that $P_x \cdot P_w = 1$, so $P_w = \cos\phi$. (It's an interesting exercise to prove this).

This is a general result, in that any circle, of any size, at any position, can be made from a number of segments, and the weight at the subsidiary points will be the same $\cos\phi$. In fact, any weight of less than 1 will create an ellipse (as, of course, will polygons whose sides are unequal lengths), and any weight greater than 1 will create a hyperbola.

Taken together, the different kinds of spline can model a huge variety of curves and surfaces. Which forms you choose depends on what you are trying to model, the kind of interface you want to present to the designer, and whatever performance constraints you have. Happy modelling!

Jules is a freelance consultant and programmer. He can be contacted at jules@cix.compulink.co.uk.





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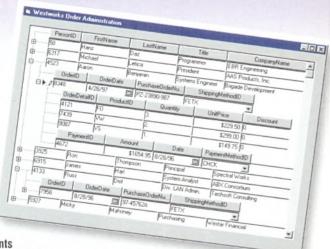
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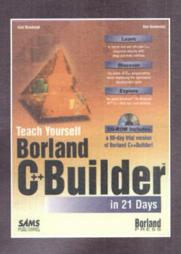
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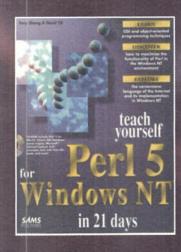


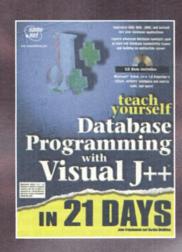
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Tuning JDBC

Chris Drawater gives some advice on speeding up JDBC access to SQL databases.

The JDBC API is a DBMS independent low-level API that supports basic SQL access to DBMS from within Java code. Developed by JavaSoft, the API defines Java classes to represent DB connections and SQL statements. Understanding the relationship between Oracle RDBMS and JDBC helps promote transaction consistent and scalable Java-Oracle applications.

Although Oracle is referenced, much of this discussion is applicable to other mainstream RDBMS.

Transaction semantics

Programs using JDBC for database updates can make use of transactions (TX) in two ways:

- Single SQL statement TX (SSTX), whereby an implicit commit is
 issued after each SQL statement. The concept of business transactions or all-or nothing updates to multiple tables does not exist
 within SSTX. Business transactions functionality can only be
 achieved at the level of whichever DBMS level constraints, triggers, foreign keys, stored procedures and so forth invoked by a single SQL statement.
- Multi-statement TX (MSTX) whereby multiple SQL statements form the basis of a single logical transaction, which is only terminated whenever the application explicitly issues an SQL Commit action. For example,

```
SQL write...
SQL write...
SQL commit (release locks)
```

You should note that failing to commit the transaction will result in it lasting until the next commit is issued, which may lead to locking problems.

Under JDBC, all SQL statements use SSTX by default. Opening a connection to an Oracle database that uses MSTX can be done as follows:

Once in an MSTX, data can be committed or rolled back using member functions of Connection, as follows:

```
Statement sq13 = con.createStatement ();
sq13.executeUpdate
          ("insert into javatest(avalue)values(20)"),
sq13.executeUpdate
          ("insert into javatest(avalue)values(21)")
sq13.close();
con.commit();          /* or con.rollback(); */
```

Alternatively, MSTX can be committed by explicitly passing a ${\tt commit}$ SQL statement to the DBMS.

```
Statement sql7 = con.createStatement ();
sql7.executeUpdate("commit work");
sql7.close();
```

A more complete code example is shown in Listing 1. The connection and error-handling code are shown in Listings 2 and 3 respectively.

Handling exceptions

As with all programming languages, some thought must be given to error handling, which in the case of Java and JDBC means exceptions. First, we must consider how Oracle handles SQL errors. If an SQL statement causes an error (for example, by attempting to insert a duplicate key) then the SQL statement aborts, but *it does not rollback any writes* performed by SQL statements within the same transaction that were executed prior to the aborted statement.

So consider the behavior of the following sequence of SQL statements received by the Oracle DBMS (no JDBC involved):

```
import java.net.URL;
import java.sql.*;
class exetest {
  public static void main (String args[])
    String url = "jdbc:odbc:ecs_dev32";
      String sqlstring;
      Connection con = null;
     try {
  con = DBConnect(url);
                                               // connect to DB
         System.out.println("\nSetting to non-autocommit...");
         con.setAutoCommit(false);
         // use the same statement for more SQL write
System.out.println("Inserting 3 rows of data ...\n");
         Statement sqlx = con.createStatement ();
sqlx.executeUpdate(*insert into javatest(avalue)values(912)*);
         sqlx.executeUpdate(*insert into javatest(avalue)values(922)*)
sqlx.executeUpdate(*insert into javatest(avalue)values(23)*);
         sglx.close();
         // see how many rows there are in the table
         Statement sql9 = con.createStatement ():
         ResultSet rs9 = sq19.executeQuery
("select count(*) from javatest");
        while (rs9.next())
           System.out.println("Rows in table : " + rs9.getInt(1));
         rs9.close():
         con.commit();
         System.out.println("\nEnding Connection...");
      catch (SQLException ex) {
        System.out.println("\nexetest main : SQL Error...");
         if (con!=null)
             sqlerr(ex,con); // there is a connection, so rollback
                                 // if no connection
     catch (java.lang.Exception ex) {
   System.out.println(*\nexetest main : Dumping...*);
        ex.printStackTrace ();
     System.out.println("Past scope of try/catch code !");
System.out.println("End of Program!");
     /* end main */
/* exetest's other members are shown in Listings 2 and 3 */
```

Listing 1 - Simple JDBC code example with exception handling.

Listing 2 - Connecting to the database (member function of exetest).

```
static void sqlerr(SQLException ex) {
    System.out.println (*\nDATABASE ERROR - SQLException caught \n*);
    while (ex != null) {
        System.out.println (*SQLState: " + ex.getSQLState ());
        System.out.println ('Message: " + ex.getMessage ());
        System.out.println (*Vendor: " + ex.getErrorCode () +"\n");
        ex = ex.getNextException ();
    }
} /* end sqlerr */

static void sqlerr(SQLException ex, Connection conn) {
    // Overloaded version
    sqlerr(ex);
    try {
        conn.rollback();
        System.out.println (*Rollback of TX ");
    }
    catch (SQLException except) {
        System.out.println (*Unable to rollback TX!*);
    }
} /* end sqlerr - overloaded version */
```

Listing 3 – The exetest class's error handling member functions.

```
SQL insert (1)... WORKS
SQL insert (2)... WORKS
SQL insert (3)... FAILS (aborts but does not rollback TX)
SQL insert (4)...
SQL commit (release locks)
```

The first two insert statements execute Ok, but the insert (line 3) fails and aborts. Unless we stop the transaction, and perform an explicit rollback in our code, the next insert (line 4) will be executed, we'll end up with an inconsistent transaction with data from inserts (1,2,4) written to the database.

JDBC can help us avoid this with the aid of Java's exception handling mechanism. Look at the following pseudocode:

```
try {
   SQL...
   SQL...
}
catch (SQLException ex) {
   // perhaps call error handler, rollback TX, exit system
}
catch (...) { /* further action */ }
```

If an exception is caught, no more code in the main body of code (the try component) is executed. The Java code following the try/catch block is then executed unless the error handling code exits

Technology

These examples are taken from Java apps (running on Windows NT 3.51) developed with JDBC v1.01, JDK v1.0, Intersolv JDBC-ODBC Bridge v1.0013 and Oracle 7 ODBC driver v1.15 accessing an Oracle v7.2.3 database running on HP-UX via SQL*Net v2 overTCP/IP.The JDBC-ODBC driver translates JDBC method calls into ODBC function calls.

the system or, within the error handling code, a further exception is thrown but not caught. The point is that exceptions can give the programmer control over the transaction handling.

The scope of exception handling needs to be carefully thought through. One try/catch module per business transaction or class method may be an appropriate level for exception handling. Depending on the acual error, SQL or general exception, the application can take appropriate action, like exiting or retrying the transaction.

Performance

Assuming an underlying physical database design of reasonable quality, performance of database accessing applications is largely dependant upon the number and nature of SQL statements involved, plus the overhead of IPC and/or network traffic where applicable.

There are 3 main principles that will help provide a head-start in the quest for performance:

- Minimize SQL interaction with the database engine. Use SQL's set processing facilities, and avoid row by row processing. Avoid 'noise' SQL that doesn't deal with data, for example fetching the date/time or user name. Consider using DBMS stored procedures/packages for business transactions as this will reduce the amount of SQL pinging across the network, and have the beneficial side effect of adding a certain level of encapsulation to your code and transactions. Take care that your SQL transactions do not hold locks for longer than is needed. In particular, don't hold locks across screens or interfaces while human interaction is awaited. PreparedStatement objects can be handy for SQL that is executed multiple times with different parameters.
- Obviously, minimize network traffic between JDBC client and database server, and return only the data that is needed (ie do your data filtering at the DBMS, not in your Java code).
- Hold the DB connection rather than connecting and disconnecting multiple times. Forking processes and spawning threads to listen to server IP sockets is expensive, and each connection could incur an overhead of a few seconds.

Don't forget that even though JDBC is relatively new, many of the old performance tricks learnt with ESQL/C or 4GL applications still apply (see *Run-time data external to the RDBMS*, EXE May '93).

Vendor commitment

Native Java JDBC drivers are (at the time of writing), eagerly awaited from the DBMS vendors. JDBC drivers with no binary code on the client platform, will make on-demand database applets and drivers a powerful architectural reality. As the technology matures, you can expect Oracle *et al* to incorporate sophisticated data fetch/array processing into their drivers for enhanced data transfer performance.

Chris Drawater has been working and performance-troubleshooting with RDBMSs since 1987, and is currently a DB Consultant at Vodafone. The JDBC API home page is at http://splash.javasoft.com/jdbc.



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Book binding

Finding the right constituents for your

C/C++ bookshelf can be a trying task.

Francis Glassborow offers some advice.

Some time ago, someone suggested that I write about how to select a good C or C++ programming book. This seems to be an excellent idea as most of us are faced with the problem of how to select a technical book from those on offer. The following are a few of the guidelines that I use.

What is it for?

Very loosely I classify books under three categories: those for reading, those for study and those for reference. Some fulfil more than one objective, but generally authors focus on one category.

You gain most of the benefit from books of the first type by reading them once. Of course you should read thoughtfully, but providing you have sufficient technical expertise, you do not need to repeatedly reread chapters in order to digest their main thrust. Titles such as Ruminations on C++ (Andy Koenig & Barbara Moo, 0-201-42339-1) or The Design and Evolution of C++ (Bjarne Stroustrup, 0-201-54330-3) fall into this category.

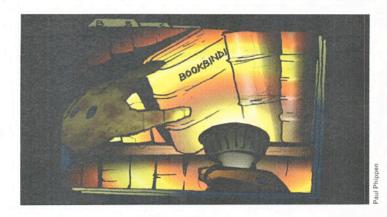
When you are studying, you should expect to read each section of a book several times until you understand the content. Study books can be very problematic for those readers who expect instant enlightenment. Examining a couple of books from this category should give you the idea. Bjarne Stroustrup's $The\ C++\ Programming\ Language$ (shortly to be published in its third edition, 0-201-53992-6) and $Scientific\ and\ Engineering\ C++$ (Barton & Nackman, 0-201-53393-6) are two such books. The more effort you invest in studying the material in such books, the more benefit you will reap.

The third category are the hardest to review because, like dictionaries or encyclopaedias, they are only helpful when you need to check a fact: little benefit is gained by attempting to read a reference book. Most importantly, they need to be correct, and that is a serious problem while languages are being developed. For example, *The Standard C Library* (P J Plauger, 0-13-131509-9) is an excellent reference from a world class expert on library implementation, but the same author's *The Draft Standard C++ Library* (0-13-117003-1) had a shelf life of about minus three months (it was seriously out of date three months before you could have bought it).

When you consider the cost of a book, how you intend to use it is an important criterion. I would happily pay more for a good study book than one written to be read once. I would cheerfully pay a lot for a good reference book with a long life, while I would want to pay very little for one whose life was limited to that of a specific product (perhaps the publishing industry should consider upgrade fees for books that are about product upgrades).

What is it about?

If you think that a book's title should answer this question, I would agree in principle but have to warn you that it is far from the case in practice.



Think of what you would expect the following titles to be about:

C++ Applications Guide, (0-07-039010-X)

C++ Programming Style, (0-201-56365-7)

Secrets of the C++ Masters, (0-12-049940-1)

Taming C++, (0-201-52826-6)

Each of these books is excellent but I do not think that anyone would guess their actual contents from the titles.

We also have the problem of the title that fails to provide a vital fact even in a sub-title or cover qualification. Sometimes a familiarity with the author's work helps here. When you see that Roger T Stevens is the author of *The C++ Graphics Programming Handbook* (0-12-668340-9) you know that it will be about MSDOS based PCs and you expect to find the work littered with low-level code. You would be right, but there is no clue on the cover.

You also need to be careful with titles such as C & C++Multimedia $Cyber\ Classroom\ (0-13-533688-0)$. This one is very good value for money but its sales have been very seriously damaged by a title overloaded with buzzwords. Generally titles overloaded with buzzwords do not stand up under a more detailed inspection. If a book was called Object-oriented 3D Animated Fractal Graphics in Java I would be amazed if it was even mediocre let alone good.

Of course a good title enhances sales and a memorable title helps when the book gets well reviewed but a title is like your choice of clothing, it needs to be appropriate for the purpose. In the current state of computer technical books publishing you need to look at tables of contents rather than titles.

There is one excellent clue in a title, the inclusion of a product. A title such as Object-Oriented Programming in XYZ C++ x.y is very unlikely to be of good quality. In order to sell it has to be on the market at the time the product is released so most of the work is based on the previous version of the book and a beta version of the new release. There will not have been any time for a technical review. As soon as it is on the market the author starts to work on the next version which will include all the errors from the current volume plus some new ones. The author may manage to remove one or two problems. Worse still, such authors spend so much time tinkering with their word-processors that they rarely have time to update their understanding of programming idioms.

Who is it for?

This is a very difficult question. You would think that authors would know who they were writing for, and some do, but most do not. For example, the author of *Who's Afraid of C++* (0-12-339097-4) believes that his book, aimed at those with no programming background, is also useful to professional programmers wanting to understand object-orientation. As the book deliberately avoids getting into such concepts as inheritance, this cannot be true. However, the book is a

TECHNIQUES BOOK BINDING

good study text for non-programmers wanting to lay a good foundation in programming skills.

Next month, I will move inside the covers to look at the internal evidence that helps sort the wheat from the chaff. But before I finish, those four titles above are mainly about: maths, defective source code, smart pointers, and pattern classes and persistence. Not exactly what their titles suggest.

Last month's problem

What is wrong with the following code?

The chances are that the first thing most of you thought was wrong was the lack of a '.h' after 'iostream' in the #include. If you tried it with Visual C++ 4.2 you would have found that was not a problem. If you try it with a more recent compiler you will find that it seems to be a problem. What is going on?

Speaking of includes, a faction of C++ experts wanted to change is the nature, to something along the lines of:

```
include "xyz"
```

The lack of a # is not a typo. In effect, they wanted include to be a new language keyword rather than a pre-processor command. In the event, they lost the day, but the sheer size of the C++ standard library meant that something needed to be done. In addition, some mechanism was needed to distinguish between some of the classic C++ headers and inclusion of the revised specifications. For example, the standard library is almost entirely encapsulated in namespace std.

What we finish up with is a number of standard #include commands that act to unlock particular resources (list, string, vector, etc). How the actual unlocking mechanism works is left up to implementers.

To make the transition harder Microsoft implemented half the mechanism in VC++ 4.2 (or maybe in an earlier version of 4.x, but 4.2 is the version I currently have mounted). However, because they had not yet encapsulated the library in the std namespace, they could not complete the mechanism. In VC++ 5.0, they have delivered a properly encapsulated standard library (though I wish they would encapsulate MFC – I'd even accept a short namespace identifier such as MFC, even though that is contrary to the guidelines on vendor-specific namespaces).

The end result of all this is that you have to modify the above code, in one of three ways: Insert a using namespace std directive, explicitly introduce the parts that I want with

```
using std::cout; using std::ostream::operator <<
(I think I have those right), or rewrite cout << i << endl; as:
std::cout::operator<<(i).operator<<(endl);</pre>
```

If you want to use that last solution you are a pure masochist. The first option (making all identifiers in the ${\tt std}$ namespace available without qualification) would be the normal choice, however you may have to resort to the second option of using declarations if you want to select which identifiers from namespace ${\tt std}$ are available without explicit qualification. The quick fix for code written for VC++ 4.2 is to insert a using namespace ${\tt std}$ directive.

Be careful of using cout, cin etc in constructors or destructors of global objects, because you are just about bound to break your code. The classic version of iostreams contains a pure hack to ensure that

those global objects have been initialised prior to any use in a file that <code>#includes<iostream.h></code>. Not only is this guarantee no longer valid, but with most modern linkers, your object code is linked before any library code and so any global variable in your code will be initialised before global library objects. Granted, a clever linker could special case the global I/O objects, but where are you going to find such a beast? In effect, you should avoid using global objects altogether, and get accustomed to the idiom that allows you to replace them with functions. Instead of:

```
Mytype mt;
write:
Mytype & mt() {static Mytype var; return var;}
and use mt() where you previously used mt. There is a second reas
```

and use \mathtt{mt} () where you previously used \mathtt{mt} . There is a second reason for using this idiom: it allows you to deal with any exceptions thrown during the initialisation of the variable.

Those of you using a version of VC++ will also get a silly message generated by a lack of a return statement in my code. The specific rules for implementing main stipulate that falling out of main without executing a return statement is equivalent to return 0. So not only does the warning (error in some versions) give you a wrong instruction (it tells you to declare main () as returning void) but it actually wants you to change conforming code to non-conforming! This problem has been perpetuated through so many versions that my only conclusion is that Microsoft has deliberately chosen to advise its users to write non-conforming C++ without any valid reason.

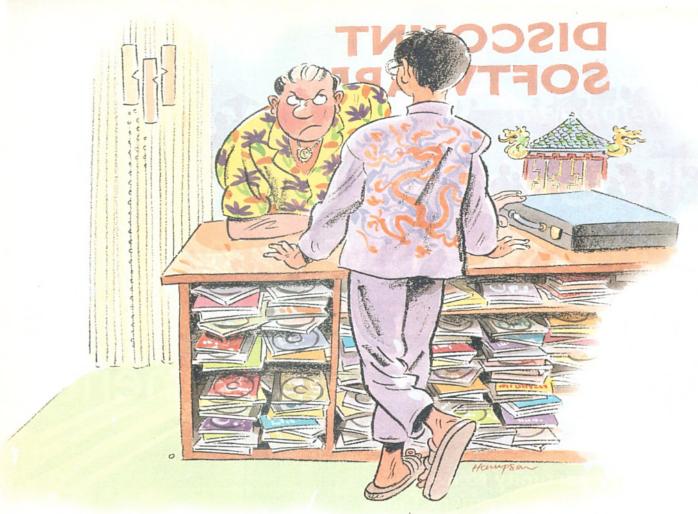
This month's problem

Look at the following class specification (from a book that recently crossed my desk). What is wrong with it?

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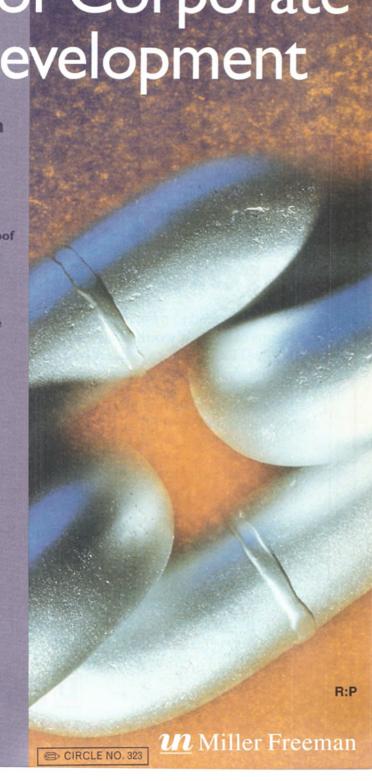
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Analysis Patterns - Reusable Object Models reviewed by Mary Hope



The Gang of Four [Gamma et al] gave a new dimension to the word 'pattern' with their seminal book on Design Patterns a few years ago. Almost overnight

the world of object oriented software gained a new perspective, not to mention vocabulary and set of conceptual tools. Martin Fowler's book is an example of the second generation of pattern books. Now that the idea of patterns is established what we need is a set of patterns that cross domains. What Martin Fowler describes are patterns that have originated in a particular domain (most are from the health services or finance and accounting) but yet can be applied in a wider setting.

This book is for the object oriented reader who knows how to use Rumbaugh's, Booch's or as it is now called the 'Unified Modelling Language' (UML) notation. The assumption is that you want to produce better models and are willing to expend some intellectual energy

in the process. Martin Fowler addresses you as a sophisticated reader who has done some modelling and developed some programs. So for instance, take the question of measurement. The simple way to do this is to incorporate it as an attribute of a class. So if I wish to record height and weight I add two appropriate attributes to the Person class. One of the most obvious weaknesses of this is that to make sense of the number we need to know the unit. So a better way to model this is to introduce a class called Quantity which holds the amount, the unit used and appropriate overloaded operators so that these can be manipulated appropriately (eg you cannot add inches to kilograms). Fowler then further develops this modelling pattern by considering the situation, in this instance in a medical setting, where thousands of potential measurements could be held on one person. Rather than have quantity as an attribute this is now incorporated into a more sophisticated class called 'measurement' which also includes the type of thing being recorded. So a measurement instance might have a type of height and a quantity of 6 feet. Better as this model is, he develops it further to incorporate

the situation where you need to record qualitative details as well as quantitative.

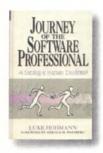
The main section of the book is thought provoking and convincing. The icing on the cake is the final section which looks at how the analysis models can be translated into code. The development of object oriented software may be seamless in the concepts used but there are various ways of implementing associations and generalisations. Fowler briefly but clearly looks at alternative ways of doing this.

In conclusion, this is a book full of practical advice and yet conceptually demanding. It provides abstract principles with concrete examples. It is a must for anyone working on object-oriented software development.

✓ Verdict: A 'must have'

Title: Analysis Patterns –
Reusable Object Models
Author: Martin Fowler
Publisher: Addison Wesley
ISBN: 0-201-89542-0
Price: £29.95
Pages: 357

Journey of the Software Professional - A Sociology of Software reviewed by Mary Hope



Why do software developers read books? Probably mainly on a need to know basis where 'how to do it' solutions are required. Such books tell us how to master languages, write Web pages or

cope with our operating system. At the other end of the spectrum, there are books to widen your perspectives and unsettle your assumptions. Some of these such as Fred Brook's 'Mythical Man Month' become classics. Others have titles which may include references to Zen, Tao, soul or journeys to put the reader in the right frame of mind. The author of this book would like us to reflect on the craft of software development and to widen our view of what skills and values it requires. It is a well-researched book, written in a readable style, is interesting, but probably not destined to become a classic in the genre.

Hohmann's starting point is that problem solving, ie software development, can be described using three interleaving concepts:

structure, process and outcome. The choice of structure helps determine process etc. While this attempt to provide a unifying theory is worthy and goes some way to justify the 'sociology' in the title of the book I was not totally convinced of its usefulness.

When the book passed on from the overarching theory to the practice, it got sharper and more useful. I was especially intrigued by the final chapters on working as a professional which included headings such as 'Office Etiquette', 'Eat in moderation', 'Know when to say no' and 'Avoiding bad working environments'. As these headings suggest this is an American style cookbook of tips and advice. If you have an allergy to sound-bites you may not like it.

The general approach is to take good management practice and contextualise it in the terminology and methodology of object oriented software development. Thus the chapter on communication starts with the general theme of message sharing and communication structures but then focuses in on the specific communication issues that are pertinent to software developers such as notation, standards and guidelines, review meetings and

project management. The author is well read and the advice is sound (eg keep standards small, monitor conformance to standards, establish a change process etc). The suggestions are divided into those for management and those for developers.

In other chapters there is useful advice on the culture of teams, coping with change, improving your skills and designing your training programme.

This is a book to dip into rather than read from cover to cover. It is a useful reminder of the interpersonal side of software development and does not fight shy of giving specific suggestions for action.

✓ Verdict: Worth a look

Title: Journey of the Software
Professional – A Sociology
of Software Development

Author: Luke Hohmann
Publisher: Prentice-Hall
ISBN: 0-13-236613-4
Price: £18.95
Pages: 416

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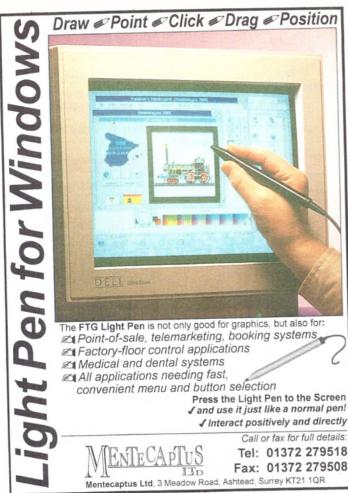
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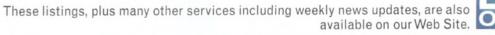
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Netscape Mail Server for UNIX	To suit	2	£695	Cirencest	QATR	using NT Server 4.0	16/06/97	1	£330	London	PYGM
Deploying Internet and Intranet Firewalls	29/07/97	4	£1375	London	LTREE	SNA Server of Windows NT Supporting NT Server 4.0 - Enterprise Tech	16/06/97 16/06/97	5	£1450 £1360	London	PYGM
Introduction to Internet/Intranet for Business Microsoft Internet Information Server	19/08/97 26/08/97	4	£1375	London	LTREE	Capacity planning with NT 4.0 Server	17/06/97	1	£330	London	PYGM
Internet Information & Index Server Support	To suit	3	£900	London	HOSK	Capacity planning of your NT 4.0 Server network	18/06/97	2	£695	London	PYGM
Supporting Microsoft Proxy & Index Servers	To suit	3	£900	London	HOSK	Windows NT 4.0 Upgrade Advanced troubleshooting NT Server 4.0	19/06/97 20/06/97	2	£695 £330	London	PYGM
Developing Java Applets Java Programming for Developers	To suit	5	£660	Cambridge London		Supporting a Systems Management Server 1.2	23/06/97	5	£1450	London	PYGM
	TO SUIT	3	£1250	London	HOSK	Supporting Windows 95	23/06/97	5	£1295	London	PYGM
LANGUAGES						Core technologies of Exchange Server Core technologies of Exchange Server 4.5	30/06/97 30/06/97	5	£1450 £1450	London	PYGM
C Primer	To suit	2	£550	Cirencest	QATR		30/06/97	5	£1360	London	PYGM
C Programming Advanced C	To suit	4	£1135 £1195	Cirencest	QATR	Computer Network Architectures & Protocols	01/07/97	4	£1375	London	LTREE
C++ for non-C Programmers	To suit	5	£1195	Cirencest	QATR	Exchange server Multisite & Internet environments		3	£1095	London	PYGM
C++ for C Programmers	To suit	4	£1135	Cirencest	QATR	Administering Windows NT 4.0 - final Windows NT 4.0 - technical overview	07/07/97 10/07/97	1	£995 £330	London	PYGM
Advanced C++ Development Techniques Java Programming	To suit	4	£1195 £1175	Cirencest	QATR	Windows 95 Technical Overview	11/07/97	1	£330	London -	PYGM
Advanced Java Development	To suit	5	£1395	Cirencest	QATR		11/07/97	1	£330	London	PYGM
Delphi Programming Fundamentals	02/06/97	5	£1250	Painswick	DPR	Supporting NT Server 4.0 - EnterpriseTech Inter-Networking with TCP/IP using NT 4.0	12/07/97	5	£1360 £1295	London	PYGM
Delphi Languages VB Programming Fundamentals	16/06/97 16/06/97	3	£825 £1250	Painswick Painswick	DPR		14/07/97	5	£1360	London	PYGM
VB5 Upgrade	23/06/97	2	£615	Painswick	DPR		21/07/97	2	£695	London	PYGM
Delphi Advanced Programming	23/06/97	3	£825	Painswick	DPR	Supporting Windows 95 Implementing directory services	21/07/97	5	£1295	London	PYGM
VB Advanced Programming	25/06/97	2	£615	Painswick	DPR		21/07/97	1	£330	London	PYGM
Delphi Programming Fundamentals Delphi Advanced Programming	30/06/97 14/07/97	5	£1250 £825	Painswick Painswick	DPR		22/07/97	1	£330	London	PYGM
Delphi Power Programming	21/07/97	5	£1250	Painswick	DPR		23/07/97 23/07/97	2	£995 £695	London	PYGM
Delphi Languages	21/07/97	3	£825	Painswick	DPR		25/07/97	1	£330	London	PYGM
VB Programming Fundamentals Delphi Languages	04/08/97	5	£1250 £825	Painswick Painswick	DPR		28/07/97	5	£1450	London	PYGM
Delphi Programming Fundamentals	11/08/97	5	£1250	Painswick	DPR		28/07/97 04/08/97	5	£695 £1450	London	PYGM
VB5 Upgrade	18/08/97	2	£615	Painswick	DPR	Core technologies of Exchange Server 4.5	04/08/97	5	£1450	London	PYGM
VB Advanced Programming Delphi Advanced Programming	20/08/97 27/08/97	2	£615 £825	Painswick Painswick	DPR	Administering Windows NT 4.0 - final	04/08/97	3	£995	London	PYGM
	21/00/91	3	2020	Cantowick	DFK	Supporting Windows NT 3.51 Exchange server Multisite & Internet environments	04/08/97	5	£1360 £1095	London	PYGM
MANAGEMENT						Supporting NT 4.0 Core Technologies	11/08/97	5	£1360	London	PYGM
Management Skills for IT Professionals	Monthly 24/06/97	4	£1375	London	LTREE	Windows NT 4.0 - technical overview	14/08/97	1	£330	London	PYGM
Influence Skills Teambuilding Skills	08/07/97	3	£1085	London	LTREE	Windows NT 4.0 Security Implementing directory services	15/08/97	1	£330	London	PYGM
Business Process Re-engineering	08/07/97	4	£1375	London	LTREE	using NT Server 4.0	18/08/97	1	£330	London	PYGM
Finance for Non-Financial Managers	22/07/97	4	£1375	London	LTREE	SNA Server of Windows NT	18/08/97	3	£1450	London	PYGM
Effective Communication Skills	29/07/97	3	£1375	London	LTREE	Supporting NT Server 4.0 - EnterpriseTech Capacity planning with NT 4.0 Server	18/08/97 19/08/97	5	£1360 £330	London	PYGM
NETWARE							20/08/97	2	£695	London	PYGM
NetWare 4.x Advanced Administration	Monthly	3	£1085	London	LTREE	Advanced troubleshooting NT Server 4.0	22/08/97	1	£330	London	PYGM
NetWare 4.x Installation and Configuration	Monthly	2	£785 £785	London	LTREE		26/08/97 26/08/97	5	£1295 £1295	London	PYGM
NetWare 4.x Design and Implementation Networking Technologies	Monthly	3	£1085	London	LTREE		29/08/97	1	£330	London	PYGM
NetWare Service and Support	Monthly	4	£1375	London	LTREE	Hand-on PC networking	15/07/97	4	£1375	Edinburgh	LTREE
NetWare 3 Support and Administration	To suit	4	£1245	Circucest	QATR	SNMP: From Workgroup to Enterprise Network	15/07/97	4	£1375	London	LTREE
NetWare 4 Support and Administration NetWare 4.x Administration	To suit	5	£1395 £1695	Cirencest	QATR	OBJECT ORIENTED PROGRAMMING					
NetWare 4.x Advanced Administration	To suit	3	£1095	Cirencest	QATR		Monthly	4	£1375	London	LTREE
NetWare 4.x Design and Implementation	To suit	3	£985	Cirencest	QATR		29/07/97	4	£1375		
NetWare Service and Support	To suit	5	£1695 £995	Cirencest	QATR		11/08/97 02/06/97	5	£1595 £1595	Birminghm Edinburgh	
Networking Technologies NetWare NFS Services	To suit	4	£1315	Cirencest	QATR	Programming in MS C++	To suit	5	£1395	Your site	PYGM
NetWare TCP/IP Transport	To suit	2	£875	Cirencest	QATR	Programming in Windows NT 3.5 using C++	To suit	4	£1195	Your site	PYGM
NetWare Web Server Management	To suit	2	£765	Cirencest	QATR	Object-Oriented Primer	To suit	3	£295	Cirencest	QATR
NetWare for SAA NetWare 4.x Administration	To suit 14/07/97	3	£1315 £1595	Cirencest	QATR	Object-Oriented Software Development Overview of the Unified Modelling Language	To suit To suit	1	£965 £295	Cirencest	QATR
Data Communications and Networks		POA		London	HOSK	Moving to the Unified Modelling Language	To suit	2	£675	Cirencest	QATR

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Course	Date	Days	Cost	Place Co	ompany	Course	Date	Days	Cost	Place Cor	mpany
Object-Oriented Analysis and Design					Jan Dale	Windows as a Development Environment I -			2		
sing the Unified Modelling Language Diject-Oriented Analysis and Design	To suit	5	£1395	Cirencest	QATR	NT & BackOffice Windows as a Development Environment II -	To suit	2	£550	London	HOSE
sing Rumbaugh's OMT	To suit	5	£1395	Cirencest		DeveloperTools	To suit	3	£825	London	HOSE
Detailed Design using Rumbaugh's OMT	To suit	3	£995	Cirencest	QATR	Visual Basic Programming for Developers Advanced Visual Basic Programming	To suit	5	£1250 £825	London	HOSE
Diject-Oriented Analysis and Design sing the Booch Method	To suit	4	£1195	Cirencest	QATR	Exchange Programming with Visual Basic	To suit	2	£595	London	HOSE
bject-Oriented Design Patterns	To suit	2	£675	Cirencest	QATR	Visual Basic 5 - New Features	To suit	2	£595 £1400	London Bristol	HOS
undamentals of programming MFC library apps ntermediate Windows based	30/06/97	5	£1395	London	PYGM	WOSA for Visual Basic Programmers WIN API Programming with Visual Basic	To suit	1	£325	London	HOSI
rogramming using MFC libraries	07/07/97		£1395	London	PYGM	Programming SQL Server with Visual Basic	To suit	4	£1120	Bristol	HOSE
ntro to Visual C++ & Object Oriented Progr Object-Oriented Analysis and Design	04/08/97		£1395 £1595	London	PYGM	Delphi Programming for Developers Advanced MFC Programming with Visual C++	To suit	5	£1250 £885	London Bristol	HOSE
	21/01/01	-	2000	LUMUUM		WOSA for Visual C++ Programmers	To suit	5	£1400	Bristol	HOSI
05/2	T 14	4	CAAAE	Cirencest	QATR	ActiveX Programming with Visual C++	To suit	3	£885 £995	Bristol London	HOSE
Supporting OS/2 Version 3 Warp Supporting OS/2 LAN Server 4	To suit	4	£1145 £1195	Cirencest	QATR	SQL Server 6.5 Administration SQL Server 6.5 Implementation	To suit	4	£995	London	HOSI
PC Support						Database Design & Microsoft SQL Server Progr	To suit	4	£1150	London	HOS
PC Configuration and Troubleshooting PC Fundamentals	Bi-week To suit	(ly 4	£1375 £795	London	DATR	PROJECT MANAGEMENT					
C Support	To suit	4	£1145	Cirencest	QATR	Project Management Skills	To suit		£1150	Cirencest	QATE
Advanced PC Support	To suit	4	£1195	Cirencest	QATR	Object-Oriented Project Management Software Project Planning and Management	To suit 24/06/97	7 4	£675 £1375	Cirencest	QATI
Compaq Technical Certification for Desktops and Notebooks	To suit	2	£570	Cirencest	QATR	Project Management: Skills for Success	Monthl		£1375		LTRE
Compaq Technical Certification for Servers	To suit	3	£850	Cirencest	QATR	SYSTEMS ANALYSIS					
Compaq/NetWare Advanced Performance Integration	To suit	3	£850	Cirencest	OATR	Software Systems Analysis and Design	12/08/97	7 4	£1375	London	LTRE
Compaq Server Technologies	To suit	2	£570	Cirencest	QATR	Software Quality Assurance	15/07/9		£1375		LTRE
Compag Insight Manager	To suit	2	£570	Cirencest	QATR	Systems Development	To cuit	5	£1365	Bournmth	HOSE
Compaq/Windows NT Advanced Performance Integration	To suit	2	£570	Cirencest		Business Systems Analysis Business Systems Design	To suit		£1365		HOSI
C Configuration and Troubleshooting	10/06/97		£1375	Birminghn	LTREE	Business Systems Implementation	To suit	4	£1100	Bournmth	HOS
Advanced PC Configuration PC Configuration and Troubleshooting	Monthly 17/06/97		£1375 £1375	London Edinburgh		Structured Analysis and Design Rapid Application Development	To suit	5	£1365	Bournmth	HOS
PROGRAMMING	11/00/01		2.0.0			for Data Driven Business Systems	To suit		£1365		HOS
132 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	To suit	5	£1195	Your site	PYGM	Data Analysis Workshop	To suit		£1155 £1210		HOS
App development using Excel 95 & VB for Apps Programming intuitive user interfaces in VB 4.0	To suit	2	£595	Your site	PYGM	Computer Systems Design System Testing	To suit		£680	London	HOS
Programming in MS C++	To suit	5	£1395	Your site	PYGM	User Acceptance Testing	To suit	2	£680	London	HOS
Programming in Windows NT 3.5 using C++	To suit	4	£1195 £595	Your site London	PYGM	Data Warehousing Design	To suit		£690 £370	Bristol London	HOS
Jser interface design for Windows 95 Application development using Word	To suit	3	£795	London	PYGM	Data Warehousing Executive Overview User Interface Design	To suit		£690	London	HOS
Hands-on Visual Basic 5	Monthly		£1375		LTREE	SYSTEMS MANAGEMENT					
Microsoft Access Programming Java for Enterprise Systems	Monthly		£1375 £1375		LTREE		To suit	3	£1095	London	PYGI
Visual J++	Monthly	y 4	£1375		LTREE	Fundamentals of Exchange Implementing Mail 3.5	To suit		£1360		PYGI
ntroduction to Programming: Hands-on Workshop	Monthly	y 4		London	LTREE	Migrating to Win 95 using	T 1	0	0000	Vennette	PYGI
Programming ntroduction to C++ for Non-C Programmers	Monthly		£1375 £1375		LTREE	Sys Management Server 1.1 Planning a Systems Management Server Site	To suit		£690 £695	Your site Your site	PYG
DS/2 Presentation Manager	To suit	5	£1495		QATR	Windows & MS DOS of support professionals	To suit	3	£895	Your site	PYG
Visual C++: Windows Programming with MFC	23/06/97	7 5	£1595	London	LTREE	Accelerated Training of NT 3.51 w/station & serve			£1450		PYG
Mastering Internet development with ActiveX Technologies	02/06/97	7 5	£1195	London	PYGM	Integrating NT Server 4.0 with Netware Networks Windows NT / 95 comparison overview	To suit		£330 £330	Your site Your site	PYG
Jpgrading from VB 4.0 to 5.0	02/06/97	7 3	£795	London	PYGM	Exchange server Multisite & Internet environment		7 3	£1095	London	PYG
Application development using Delphi 2.0 C/S	09/06/97		£1320 £1195		PYGM	Administering Windows NT 4.0 - final	02/06/9		£995 £330	London	PYG
Programming with Access for Windows 95 Client/Server development using VB & SQL Server			£950	London	PYGM	Windows NT 4.0 - technical overview Windows NT 4.0 Security	05/06/9		£330	London	PYG
ActiveX development using VB 5.0	16/06/97	7 5	£1195	London	PYGM	Supporting NT 4.0 Core Technologies	09/06/9	7 5	£1360		PYG
Fundamentals of VB 5.0 Fundamentals of Microsoft VB 4.0	16/06/97		£795 £795	London	PYGM	Installing Internet information Server 2.0 Implementing directory services	10/06/9	7 1	£330	London	PYG
Advanced programming in VB 4.0	23/06/97	7 5	£1195		PYGM	using NT Server 4.0	16/06/9	7 1	£330	London	PYG
Upgrading from VB 4.0 to 5.0	30/06/97		£795	London	PYGM	SNA Server of Windows NT	16/06/9		£1450		PYG
Fundamentals of programming MFC library apps Mastering Visual J++	30/06/9		£1395 £1395		PYGM	Supporting NT Server 4.0 - Enterprise Tech Capacity planning with NT 4.0 Server	16/06/9 17/06/9		£1360 £330	London	PYG
Mastering Visual 6 44				CONTRACTOR OF		Capacity planning of your NT 4.0 Server network	18/06/9	7 2	£695	London	PYG
with ActiveX Technologies	07/07/9	7 5	£1195	London	PYGM	Windows NT 4.0 Upgrade	19/06/9		£695 £330	London	PYG
Intermediate Windows based programming using MFC libraries	07/07/9		£1395		PYGM	Advanced troubleshooting NT Server 4.0 Supporting a Systems Management Server 1.2	23/06/9		£1450		PYG
Programming with Access for Windows 95	14/07/9	7 5	£1195		PYGM	Supporting Windows 95	23/06/9	7 5	£1295	London	PYG
Application development using Delphi 2.0 C/S ActiveX development using VB 5.0	21/07/9		£1320 £1195		PYGM	Windows OS's and services architecture Core technologies of Exchange Server	25/06/9 30/06/9		£995 £1450	London London	PYG
Fundamentals of VB 5.0	21/07/9	7 5	£795	London	PYGM	Core technologies of Exchange Server Core technologies of Exchange Server 4.5	30/06/9	7 5	£1450	London	PYG
Win32 Systems and Network Programming	22/07/9		£1375 £1195		LTREE	Supporting Windows NT 3.51	30/06/9	7 5	£1360		PYG
Advanced programming in VB 4.0 Fundamentals of Microsoft VB 4.0	23/07/9	7 3	£795	London	PYGM	Exchange server Multisite Internet environments Administering Windows NT 4.0 - final	07/07/9		£1095 £995	London London	PYG
Client/Server development using VB & SQL Serve	er 28/07/9	7 3	£950	London	PYGM	Windows NT 4.0 - technical overview	10/07/9	97 1	£330	London	PYG
Upgrading from VB 4.0 to 5.0 Intro to Visual C++ & Object Oriented Progr	04/08/9		£795 £1395	London	PYGM	Windows 95 Technical Overview	11/07/9		£330	London	PYG PYG
Programming with Access for Windows 95	11/08/9	7 5	£1195	London	PYGM	Windows NT 4.0 Security Supporting NT Server 4.0 - Enterprise Tech	11/07/9		£330 £1360	London London	PYG
Mastering Visual J++	11/08/9		£1395		PYGM	Inter-Networking with TCP/IP using NT 4.0	14/07/9	37 4	£1295	London	PYG
Application development using Delphi 2.0 C/S Advanced programming in VB 4.0	18/08/9 18/08/9		£1320		PYGM	Supporting NT 4.0 Core Technologies	14/07/9		£1360 £695	London London	PYG
Advanced Windows Programming with MFC	19/08/9	7 4	£1375	London	LTREE	Implementing & supporting Proxy Server Supporting Windows 95	21/07/9		£1295		PYG
Client/Server development using VB & SQL Serve	er 26/08/9	7 3	£950	London	PYGM	Implementing directory services					
Mastering Internet development with ActiveX Technologies	26/08/9	7 5	£1195	London	PYGM	using NT Server 4.0	21/07/9		£330	London	PYG
Java Programming	26/08/9	7 4	£1375	London	LTREE	Capacity planning with NT 4.0 Server Supporting Internet information Server	22/07/9		£995	London	PYG
Introduction to Programming	To suit			London London	HOSK	Capacity planning of your NT 4.0 Server network	23/07/	97 2	£695	London	PYG
Structured Programming Professional Skills for Programmers	To suit				HOSK	Advanced troubleshooting NT Server 4.0	25/07/		£330	London London	PYG
COBOL Fundamentals	To suit	t 5	£1260) London	HOSK	Supporting a Systems Management Server 1.2 Windows NT 4.0 Upgrade	28/07/		£1450		PYG
COBOL Advanced	To sui	t 5	£1260) London	HOSK	Windows OS's and services architecture	30/07/	97 3	£995	London	PYG
Developing OO Programs in Micro Focus Object COBOL	To sui				HOSK	Core technologies of Exchange Server	04/08/				PYG
C Programming Workshop	To sui				HOSK	Core technologies of Exchange Server 4.5 Administering Windows NT 4.0 - final	04/08/				PYG
Advanced Programming in C	To sui		£1260		HOSK	Supporting Windows NT 3.51	04/08/	97 5	£136	0 London	PYG
Programming in C++	To sui			London	HOSK		05/08/	97 4 97 3			LTR
Introduction to C++ and OO Concepts	To sui		£125	London	HOSK	F b					

Course	Date	Days	Cost	Place	Company	Course	Date	Days	Cost	Place Co	mpany
Windows NT 4.0 - technical overview	14/08/97	1	£330	London	PYGM	WINDOWS					
Windows NT 4.0 Security	15/08/97	1	£330	London	PYGM	MINDOWS					
Implementing directory services						Windows 95 Support and Networking	Monthly	5	£1595	London	LTREE
using NT Server 4.0	18/08/97	1	£330	London	PYGM	Microsoft Office 97 for Power Users: Hands-On	Bi-week		£1375	London	LTREE
SNA Server of Windows NT	18/08/97	3	£1450	London	PYGM	Hands-OnTCP/IP Internet working on Windows NT	Monthly	4	£1375	London	LTREE
Supporting NT Server 4.0 - Enterprise Tech	18/08/97	5	£1360	London	PYGM	Windows Programming in C	To suit	5	£1395	Cirencest	QATR
Capacity planning with NT 4.0 Server	19/08/97	1	£330	London	PYGM	Windows Programming with					
Capacity planning of your NT 4.0 Server network	20/08/97	2	£695	London	PYGM	Visual C++ and the MFC Library	To suit	5	£1395	Cirencest	QATR
Advanced troubleshooting NT Server 4.0	22/08/97	1	£330	London	PYGM	Win32 Programming Essentials	To suit	5	£1395	Cirencest	QATR
Supporting Windows 95	26/08/97	5	£1295	London	PYGM	Windows OLE Application Programming	To suit	5	£1395	Cirencest	QATR
Inter-Networking with TCP/IP using NT 4.0	26/08/97	4	£1295	London	PYGM	Windows OLE System Programming	To suit	5	£1495	Cirencest	QATR
Windows Open Systems Architecture	26/08/97	4	£1375	London	LTREE	Microsoft Systems Management Server Admin	To suit	4	£1295	Cirencest	QATR
Windows OS's and services architecture	27/08/97	3	£995	London	PYGM	Creating Web Content with ActiveX Technology	To suit	5	£1375	Cirencest	QATR
Windows 95 Technical Overview	29/08/97	1	£330	London	PYGM	Introduction to Windows 95	To suit	1	£295	Cirencest	QATR
Building Office 97 Intranet Applications	Monthly	4	£1375	London	LTREE	WINDOWS NT					
TESTING						Microsoft Certified Systems Engineer	To suit	0	£0	London	HOSK
						Windows NT Optimisation & Troubleshooting	Monthly	5	£1595	London	LTREE
Practical Software Testing Methods	17/06/97	4	£1375	London	LTREE	UNIX and Windows NT Integration	Monthly	4	£1375	London	LTREE
						Developing Windows NT Server Applications	To suit	5	£1495	Cirencest	QATR
UNIX						Supporting Windows NT 3.51 Servers	To suit	4	£1295	Cirencest	QATR
						Supporting Windows NT4.x Servers	To suit	4	£1295	Cirencest	QATR
UNIX Workshop	Bi-weekl	y 4	£1375	London	LTREE	Supporting Microsoft Windows NT Server 3.51	To suit	4	£1295	Cirencest	QATR
UNIX Fundamentals	To suit	4	£1095	Cirences		Supporting Windows NT Server 4.x -					
UNIX Systems Administration	To suit	4	£1095	Cirences		Enterprise Technologies	To suit	4	£1295	Cirencest	QATR
Mastering UNIX Shell Scripts	To suit	4	£1095	Cirences		Windows NT 4 Workstation and Server: Hands-on	16/06/97	5	£1595	Edinburgh	LTREE
UNIX Programming	To suit	5	£1295	Cirences		Windows NT 4 Workstation and Server: Hands-on	Bi-week		£1595	London	LTREE
Motif User Interface Programming	To suit	5	£1295	Cirences		Porting Apps from UNIX to Windows NT	Monthly	4	£1375	London	LTREE
UNIX Tools and Utilities	08/07/97	4	£1375	London	LTREE	Windows NT 4 Workstation and Server: Hands-on	21/07/97	5	£1595	Birminghm	LTREE
UNIX Server Administration	22/07/97	4	£1375	Edinburg	h LTREE	WINDOWS SUPPORT					
UNIX Programming	29/07/97	4	£1375	London	LTREE	WINDOWS SUPPORT					
X Window System Programming	19/08/97	4	£1375	London	LTREE	Implementing Windows NT Security: Hands-on	Monthly	4	£1375	London	LTREE
UNIX Workstation Administration	26/08/97	4	£1375	London	LTREE	Supporting Windows 95	To suit	4	£1195	Cirencest	QATR
UNIX Primer	To suit	2	£550	London	HOSK	Supporting Windows 3.x	To suit	4	£1245	Cirencest	QATR
UNIX Shell Programming	To suit	3	£795	London	HOSK	Supporting Microsoft Windows 95	To suit	5	£1395	Cirencest	QATR
UNIX System V Administration	To suit	3	£795	London	HOSK	Supporting Windows for Workgroups	To suit	3	£1035	Cirencest	QATR
AIX System V Administration	To suit	3	£795	London	HOSK	Supporting Microsoft Systems Management Server	To suit	5	£1395	Cirencest	QATR
UNIX API & C/Server Programming	To suit	5	£1250	London	HOSK	Microsoft Systems Management Server	12/08/97	4	£1375	London	LTREE
Networked UNIX System Administration	To suit	5	£1250	London	HOSK	NetWare to Windows NT Integration & Migration	22/07/97	4	£1375	London	LTREE
UNIX Networking Features	To suit	3	£795	London	HOSK	Windows 95/NT/3.11 Multiplatform Networking	29/07/97	4	£1375	London	LTREE

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REF: SC/06/EXE

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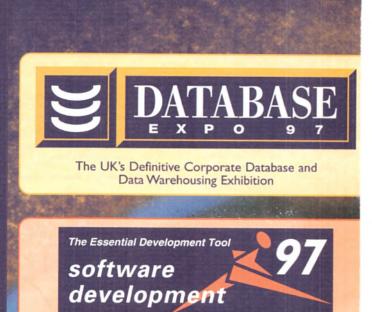
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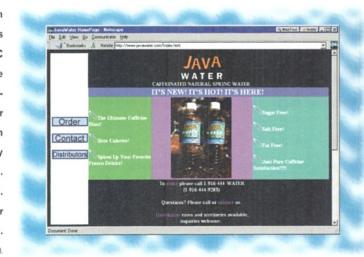


The ultimate drink

Remember the archetype of the American (this wouldn't happen here, of course) programmer with piles of half-empty pizza boxes and Jolt cola cans? Well, forget all about it. In this age of PC (political correctness, not the other one), American software developers can now survive on... Java Water. It's fat-free, sugarfree, everything-free but caffeine. Bliss! A sad note: Java Water is not yet available in the UK. Ctrl-Break has enquired about, on your behalf, but is still waiting for a reply from River City Beverages, the manufacturers of this revolutionary product. Limited information can be found at http://www.javawater.com.

Sun was unavailable for comments as to whether Java Water will get the Pure Java logo.

(Thanks to Jack Schofield for discovering Java Water).



Call me Ver

Ms Stob has acquired some new duties.

Nobody was more surprised than Verity Stob herself when she was elected on a Sleaze In Moderation ticket for the constituency of Tory-On-Slide – she only accepted the nomination because it was that or go to the bar, and the queue at the bar was ridiculous, even for a Friday. However this surprise was topped on 2nd May when Mr Blair phoned and invited her to head up his team at the newly created Ministry of Programming. For those of you who missed it, here is her ground-breaking interview on the Today program.

Naughty: It's twenty two minutes past eight. I beg your pardon, I mean seven. Eight. Seven. And in the radio car we have Verity Stob, the newly appointed Minister for Programming. Good morning, Minister.

Stob: Morning, Jim.

Naughty: Now I understand your bailiwick is considerably wider than just straight programming.

Stob: Yes indeed. For example, I'm pleased to be able to announce that later on today the Government will be publishing a Green Paper to tackle the Caps Lock problem, and although I can't give details now, I can assure you that our plans will benefit all keyboard users, old and young, black and white, rich and poor, all over the country.

Naughty: I should just remind listeners that the Caps Lock problem...

Stob: The Caps Lock problem, which has existed throughout 18 years of Tory misrule, is that the Caps Lock key, which nobody uses in anger anyway, is placed between the tAB KEY AND THE LEFT SHIFT KEY WHERE YOU KEEP HITTING IT BY MISTAKE WITH PREDICTABLE CONSEQUENCES.

Naughty: Quite. But what can the Government do about it?

Stob (very condescending): Jim, you know that as much as I admire this fine wireless programme of yours, I must inform the House of Commons about our plans before I tell you...

Naughty: In that case, can we turn to...

 ${f Stob}$ (bogus indignation): No, no. You asked me a question and you must let me answer it.

Naughty: (grunts)

Stob (now more condescending still – positively Heseltinish): I don't think it is giving very much away to say that the Government feels that the Caps Lock key belongs way over the top right hand side of the keyboard, next to its little green light, and that our proposed action will make sure that this happens and happens quickly. We also intend holding a public inquiry into three-button mice...

Naughty: A case of ergonomics, ergonomics, ergonomics?

Stob: (haughty silence)

Naughty (pleased at having shut her up): Minister, can we turn to a more serious concern which is afflicting many of the UK's top programmers. Go into any software house, open any cupboard, and out will drop 43 copies of Western Samoan Windows for Workgroups, 58 copies

of the German Language Win 3.1 SDK and a Hebrew DDK for DOS 6.2. What are you going to do about Dead MSDN CD Glut?

Stob: I am very glad you asked me about DMCG. The fact of the matter is that I am organising a taskforce of lorries...

Naughty: Paid for with lottery money?

Stob: Paid for with lottery money. The lorries will travel around all the UK's software houses and collect all the old CDs...

Naughty: Is it possible to destroy them? Can you burn them safely?

Stob: Good gracious no. When burnt, these CDs give off the most noxious gases.

Naughty: So how are you going to get rid of them?

Stob: We are digging an enormous pit on the Isle of Wight in the shape of a parabola. We are going to line this pit with the CDs to create a giant mirror.

Naughty: With what intention?

Stob: We will adjust the mirror to focus the sun's rays, and use it to burn a hole through the moon.

Naughty (momentarily forgetting this is Radio 4): Say what?

Stob: It's moderate, yet it's radical.

Naughty (getting a grip): But Minister, what is the point?

Stob: Have you thought of intergalactic tourism. 'Forget Saturn's rings; come to Earth, the planet with a satellite with a hole.' Besides...

Naughty: Yes, Minister?

Stob: I'm sure we can all think of more stupid things lottery money is spent on.

Naughty: Verity Stob, Minister of Programming, thank you very much.

McGregor: It's twenty-five minutes past seven, and time for Gary Richardson with the sport. And Gary is wearing a very nice red tie this morning &c &c &c.









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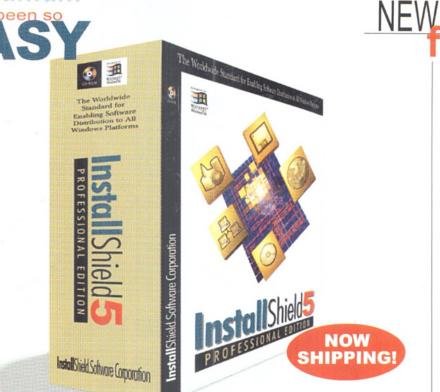
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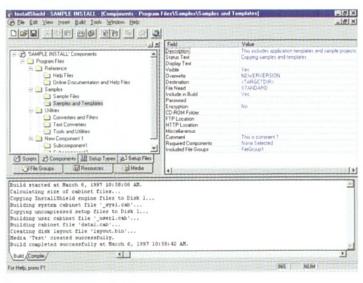
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