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News & Views

Visual UML

A Powerful, Affordable Object Modeler for Visual Basic

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Visual UML Professional for Visual Basic adds an integrated, bi-directional Visual Basic interface with code generation and reverse-engineering of Visual Basic (4.0 - 6.0) projects, classes, etc.

Visual UML Developers Edition adds Visual Basic for Applications (VBA) and a bi-directional interface to the Microsoft Repository for model storage.

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ActiveX Component Suite 3.0 bundles three of the best selling ActiveX products on the market into one low-priced toolkit. It includes Data Explorer 3.0, DataTable 5.0 and WinX Component Library 3.0 (which includes TreeViewX). All of these fully support ActiveX Data Objects and OLE DB for compatibility with Visual Studio 6.0.

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MailBuilder is a set of ActiveX controls and drop-in forms that make it quick and easy to build e-mail applications. It includes an enhanced SMTP (ESMTP) control supporting pipelining and DNS, an unsurpassed MIME control with MIME editing capabilities and local MIME processing, a POP3 control, high performance IMAP4 (the latest and greatest for remote management of e-mail), reusable, drop-in forms and seven sophisticated sample applications. The controls have been extensively tested for compatibility with a wide variety of e-mail products. Why don't you try it out?

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The Enterprise factor



Many found the change of name from Borland to Inprise quite ridiculous. To take cheap shots at Borland for this move is rather hypocritical though. This was only a very visible effect of a trend that started much earlier and is not limited just to Inprise. Marketing departments of software publishers and of IT companies in general have definitively adopted this word as a favourite (alongside worse ones such as 'leverage').

The irony of this situation is that the E word is most prominent in the discourse of companies that were originally targeting exclusively the (lonely) desktop. It feels like a self-fulfilling prophecy: if we keep

repeating the E word enough it'll have to become true!

Daryl Plummer, VP and Research Director (Application Development Tools and Technology) at the Gartner Group, mentioned in a recent presentation that about 20% of all applications developed are enterprise applications. This might surprise you as being very little, but for the Gartner Group, enterprise software means high volume transaction applications that manage the core business of an enterprise. A fair definition.

In the case of Inprise and most of its competitors, the E word has many very different meanings. Brian Ledbetter, Product Manager at Inprise, considers it to be a combination of three things: software that is not just a boxed product, support (often done in partnership with system

integrators), and a comprehensive solution. At the same time he also defines the E word as being a departure from Windows NT; internally the word implies support for Windows NT and 95, Unix, AS/400, mainframes, and packages such as SAP. The first definition, which covers offering TP Monitors, might lead to systems fitting the Gartner Group definition.

On the other hand, the second definition partly fits another situation that has arisen these last few years, ie it is used mainly to differentiate product offerings from 'standard' and 'professional' editions. In this latter context (replacing what were called Client/Server editions) what is it if not a licence to print money?

The main difference between the enterprise edition

and all the others is database support. These days, apart from specialised fields such as embedded systems, everyone at some point or another needs to access a database, and it even sometimes make sense to have a database in an embedded product. If you can guarantee that you'll never ever need to write any code that accesses a database, the professional edition might be enough. But even then sometimes you still need the enterprise edition to receive more comprehensive documentation. As to the standard editions, they really feel like a learning tool or a taster for the real thing.

As Dave Jewell mentioned on Cix, perhaps all this should be attributed to a misspent youth watching too much Star Trek. *David Mery*

Technobabble?



If you're a Star Trek fan, you'll be familiar with the term technobabble. It refers to the long and often incomprehensible streams of dialogue the actors on that show are required to learn. Such as 'the magneton flux generators have de-polarised due to the inverted tachyon field, Captain'. It doesn't mean much to you and me, whether we already know about tachyons or not. In fact, it doesn't generally mean *anything*. Technobabble is an easy way to explain away those things that cannot be explained.

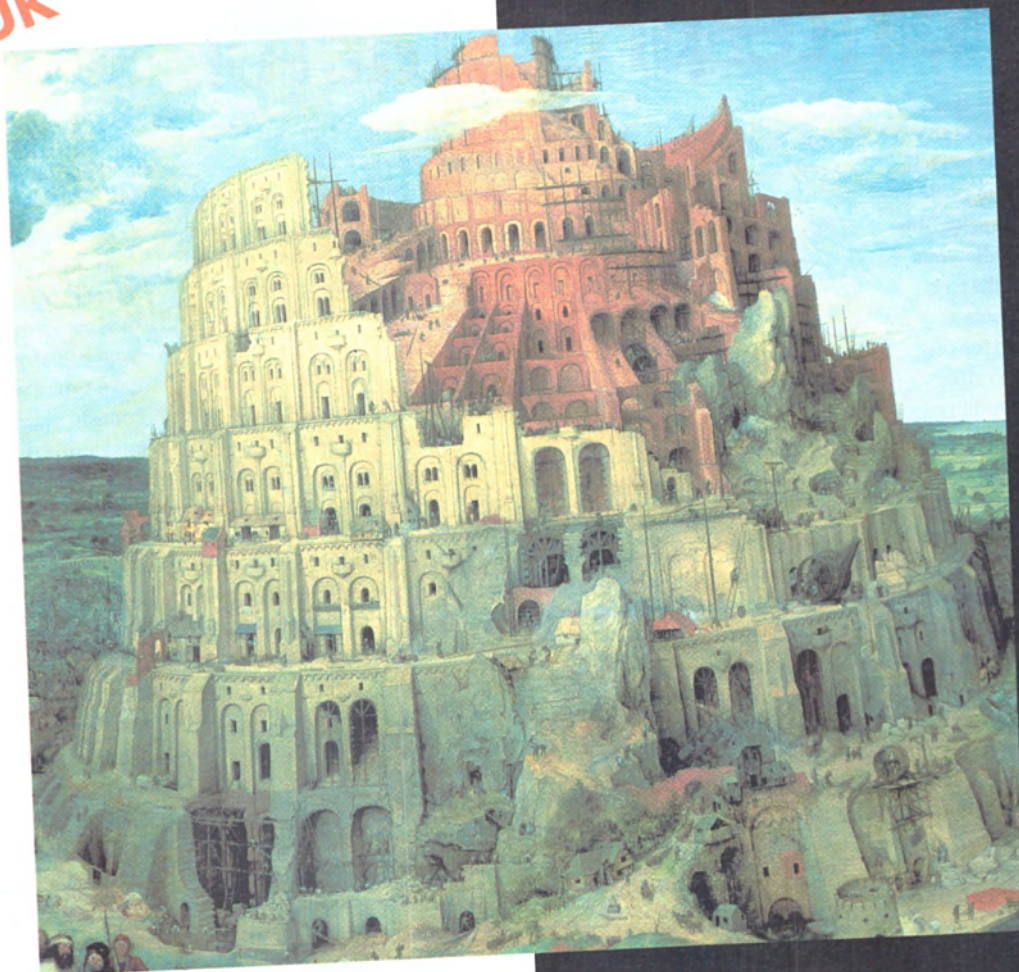
Slightly over a year ago, I remember going to a visual tools conference that was held at

a college of Oxford University. Apart from the extreme spartan nature of the accommodation, the only thing that sticks in my mind is attending a talk on 'advanced C++'. Now I consider myself a reasonably competent programmer, although by no means a coding genius. But about ten minutes into the talk, I suddenly realised that I didn't understand a word being said. I should hasten to point out that this had nothing to do with the presentation style of the speaker, as he was a professional trainer and by all accounts was very good at his job. It was simply that the streams of C++ minutiae spewing forth had become, to my supposedly trained ear, technobabble.

The question I have to ask is this: is it just me, or has C++ become too complex for its own good? What started out as a 'better C' has become a many-headed monster, apparently developing into the all-purpose, all-singing, all-dancing, all exception-handling language of the decade. As an unreconstructed C programmer, I have never been able to get used to all the excess baggage that seems to come with C++. I liked the idea of sailing close to the wind, of using a language that was best described as mid-level rather than high-level. I liked being able to do unsafe casts if my programs needed it. In short, I liked being in control. With C++, I no longer feel in control. It's too much like hard work.

I wonder how many developers truly understand the current C++ language, or use it in their software. I suspect that developers simply use the flavour of C++ that they need for a given project. When a language gets so complicated that experienced programmers become confused, it's time to go back to the drawing board and start again. I notice that P.J. Plauger, a luminary of the C++ community, is promoting 'Embedded C++'. This is not, as you might suspect, C++ specialised for embedded systems, but a cut-down bare-bones version of C++ (no multiple inheritance or virtual base classes, for example). Perhaps this might be the 'better C' that was the original goal. *Neil Hewitt*

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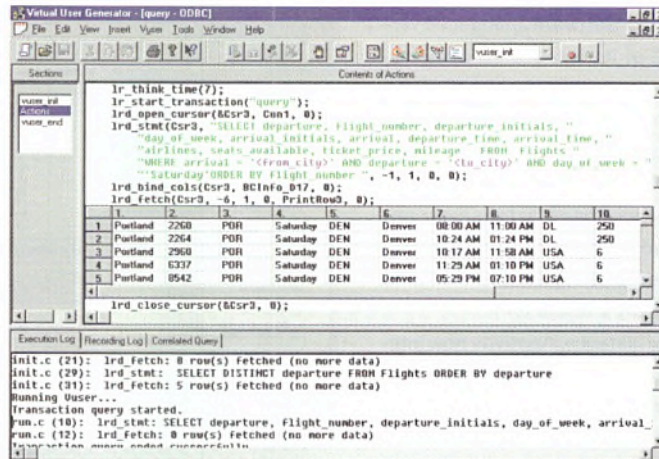
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Isolating performance bottlenecks

TestSuite Enterprise 5.0, as the name suggests, is a suite for testing enterprise applications. Mercury Interactive's suite comprises LoadRunner 5.0, for load testing, TestDirector 5.0, for general test management, and WinRunner 5.0, for functional testing.

In addition to detecting problems, Mercury Interactive claim that LoadRunner can not only predict application behaviour but also find performance bottlenecks and quickly isolate them. Version 5.0 includes three new monitors to help users isolate system problems. LoadRunner's Transaction Breakdown Monitor displays client, network, and server delays for end-to-end transaction response time. The Network Delay Monitor helps users determine delays per segment in the network, and the Server Monitor provides real-time monitoring of server performance.

TestDirector 5.0 manages the testing process to determine an application's readiness. It combines the planning, execution, and tracking of testing through the use of a single central repository. It is



designed with an 'open test architecture' to preserve the use of existing tools within an organisation. A visual application programming interface enables any application to communicate with any TestDirector project database and create, retrieve, and update project database records. TestDirector can drive other testing tools and return results to the single repository.

WinRunner 5.0, for functional testing, sees add-in support for testing Java environments such as Sun's Java Development Kit and

Java Foundation Classes, PeopleSoftWeb, Oracle Developer/200 and Oracle Applications NC. Users can perform functional and load tests for Java-based applets and applications as well as test Netscape's Communicator, Microsoft's IE, and Sun's AppletViewer using TestSuite Enterprise.

TestSuite Enterprise 5.0 supports 'out of the box' lifecycle tools such as Intellicorp's LiveModel and Select Software's Select Component Factory.

www.merc-int.com

HomeSite is where the HTML is

HomeSite 4.0 is the latest release of Allaire's HTML editing tool. Version 4.0 adds a visual development environment to its HTML code-centric editing approach. Aimed at professional web developers, the idea is to provide full control over HTML code combined with the flexibility of visual page design. It provides support for the Synchronised Multimedia Integration Language (SMIL), DHTML, Cascading Style Sheets, and JavaScript.

There is an edit view for writing code, a design view for designing pages visually, and a browse view for checking the progress of a site in a browser. To automate recurring tasks, user-defined macros and programmable hot keys have been added. The new interface is customisable with dockable toolbars and support for tag snippets that can be private or shared with a team. Among new code-editing features there is a tag inspector property sheet and customisable colour-coding for JavaScript, ASP, Perl, SQL, and DHTML. There is a style editor for editing Cascading Style Sheets.

Version 4.0 supports source control systems, including Visual SourceSafe, for the building and management of large-scale sites. Finally, it includes enhanced HTML validation, spell checking, and link verification. For Windows 95, 98, and NT, it is priced at £75. It is available for evaluation from the Web. Unipalm are the UK distributors.

www.allaire.com/HomeSite

Two small footprints

ObjectStore PSE Pro 3.0, the Java and C++ embedded database suite, comprises two 'small footprint' DBMSs – PSE Pro for Java (300 KB) and PSE Pro for C++ (150 KB) – and a set of visual development and data synchronisation tools. It runs on any Java-supporting platform. As well as Personal Java, the Handheld PC Professional Edition of Windows CE will be supported.

The suite includes new data synchronisation and enterprise connectivity features via XML and COM/DCOM.

ObjectStore PSE Pro 3.0 is available from the Web. The Developer Edition costs \$245 per developer, and an end-user licence costs \$95 per user.

www.objectdesign.com

Stingray now supports Visual Studio 6.0. The Stingray division of Rogue Wave Software has announced that its MFC extension classes, ActiveX controls, WFC components, and Visual Case tool will be fully compatible with Microsoft's latest release. www.stingray.com

The Digital Enterprise Toolkit for Visual Studio extends the capabilities of Visual Studio to support applications for Digital Unix. The Enterprise Toolkit provides additional Unix and product documentation such as the Digital Unix reference pages and programming documentation. www.unix.digital.com/enterprisetoolkit/index.html

3D Control from Superscape is for developers wishing to introduce interactive 3D environments into their applications. As an ActiveX control, it is designed to provide integration with other development tools, such as VB and Delphi. It is priced on a runtime licence basis. www.superscape.com

With the Ermas Active Server Suite developers can control access to web pages, build DHTML tables from database data, manage user profiles, create and send email, and securely move data to and from a web server. www.componentsource.com

Users of Enterprise and Workgroup editions of Ingres II will have access to OpenROAD 4.0 (Open Rapid Object Application Development) a major release of Computer Associates' graphical development environment for building client/server applications.

Java in Progress

W3C has released the Document Object Model (**DOM**) Level 1 specification as a W3C Recommendation. It defines a platform- and language-neutral interface to access and update dynamically a document's **content**, structure, and style. www.w3.org

Omnis Studio 2.0 is a **RAD** tool. A Component Store allows the integration of JavaBeans, ActiveX controls, and Omnis components into applications. The Property Manager and Notation Inspector enable the interrogation and modification of such **components**. www.omnis-software.com

COOL:Gen 5.0 is **Sterling** Software's model-based application and component development tool. Support for transactional middleware has been extended by integrating IBM's TXSeries Encina API. There is enhanced support for BEA's **Tuxedo** and it can target HPUX 11. www.sterling.com

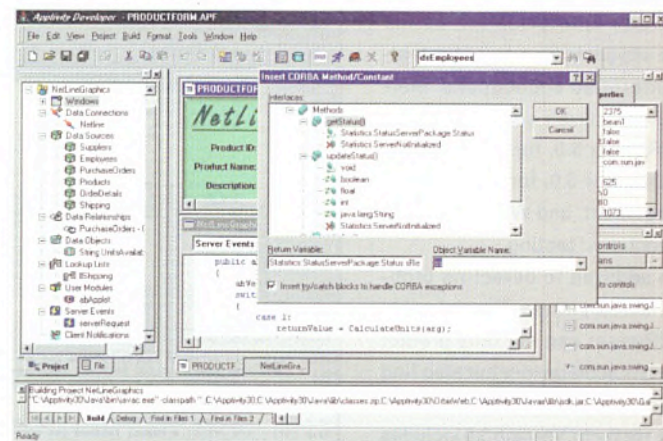
Forté WebEnterprise Professional Edition, including **Forté WebEnterprise Designer** and **Forté Application Server**, enables the rapid creation of **transactional** web applications. For Windows NT, Solaris, and other Unix platforms, pricing starts at £24,990. www.forte.com

Embedded System Products (ESP), the real-time **kernel** provider for embedded applications, will merge operations and product lines with **Beacon Development Tools**. **ESP** now produces **BeaconSuite**, an integrated development environment for 16- and 32-bit x86 applications. www.rtxc.com

Progress Software announced version 3 of its integrated development environment and application server Apptivity at its user conference in London last month. Both the IDE and the server environment have been extensively improved with many new features, wizards, and a look more similar to Microsoft's Visual C++.

For instance, Apptivity now integrates with source code control applications and supports multiple typed projects. JavaBeans, BusinessBeans (a server-side extension of JavaBeans which allows distributed multi-tiered applications), and Enterprise JavaBeans are supported. The Developer toolset is part of the SmartComponent Framework intended to build components reusable in many applications.

The SmartClient feature of the application server adds support for HTML clients in addition to Java. The socket-based client/server has been replaced by IIOP, hence communication, proxy support,



distribution and load balancing are provided by Corba objects. SmartConnect lets an application connect to non-ODBC data sources and automatically converts the data in rows and columns.

SSL-enabled communication has been added and the Apptivity Explorer provides system management in a Java-based tool.

Apptivity 3 is promoted as a **Java** application server, the emphasis on Java is pervasive throughout all

Progress presentations. Surprisingly, Progress insists more on the Java support than on the functionality of its application server. However, Rick Reidy (VP product development) admits that other languages will be supported in the future. The first step will be C++ components, wrapped as Enterprise Java Beans.

Apptivity 3 is scheduled to ship at the end of the month. Apptivity Developer will be \$995.

www.progress.com

The face of faceless devices

Wind River Systems, the provider of software development tools for embedded applications, is aiming to put a 'face' on faceless devices with the addition of **HTML Works** and **eNavigator** to its **Graphics Portfolio**. This is a collection of products that enable GUIs and the rendering of graphical content on traditional embedded devices. The other two core products are **PersonalJava** for **VxWorks** and **Zinc** for **VxWorks**.

HTML Works is a set of **HTML** and **JavaScript** components for **Wind River's VxWorks**. There is a reference UI that enables developers to build and deploy more complex interactive UIs for embedded devices that are connected to a network but do not perform general web browsing.

eNavigator is **Wind River's** version of **NCI's eNavigator** product. It is a web browser toolkit for applications – such as information appliances, kiosks, and handheld devices – that require a simple browser for retrieving and displaying information.

PersonalJava for **VxWorks** comes with a reference 'look-and-feel' implementation toolkit but allows OEMs to define unique 'designer-brand' interfaces. **Wind River** claim to offer the first **RTOS** port of **PersonalJava** that has been certified for full compatibility.

Finally, **Zinc** for **VxWorks** is a tool suite for developing small-footprint, natively compiled GUIs for performance-driven embedded devices. It provides a **C++ API** for the creation of graphical user interfaces and event-driven applications. It includes **GUI** libraries, a visual design tool (**GUI** builder), and a portable make utility.

www.windriver.com

The rule of code

Logiscope C/C++, from **Reflex Technology**, is a software development tool for analysing code complexity, measuring test coverage, and verifying programming rules. Version 2.0, for Windows 95 and NT, sees the addition of a **C RuleChecker** module to allow users to create and verify programming rules. **Logiscope C/C++** consists of three modules: **Audit**, **TestChecker**, and **RuleChecker**.

The **RuleChecker** module contains 50 predefined rules, as well as any custom rules created by the user. It acts as an extra form of verification for coding standards.

The **Audit** module is used to specify quality requirements for a given project's source code and to quantitatively check the software's conformity. **TestChecker** allows developers to measure the completeness of tests with various test coverage metrics.

www.reflex-tech.co.uk

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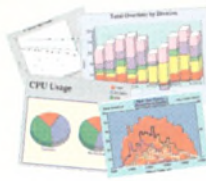
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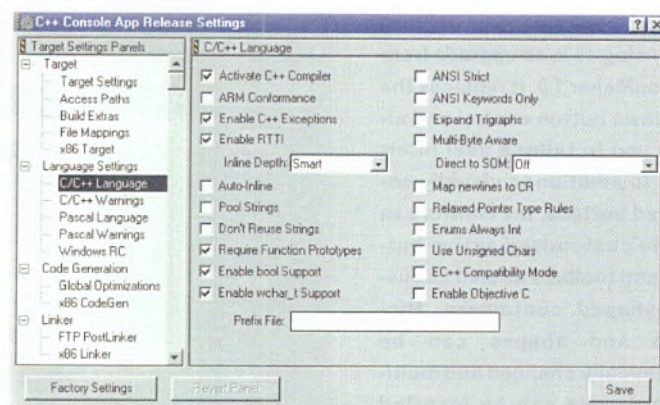
Enquiry No. Nv6

Template specialisation for CodeWarrior 4

CodeWarrior Professional 4 is the latest release of CodeWarrior software development tools for Windows and the Macintosh. The release includes an improved version of Metrowerks' IDE, enhanced support for C++ and Java development, and further processor-specific code-generation support for PowerPC and Pentium-class processors.

There are a number of updates to the IDE, principally support for the familiar Windows MDI interface. There is improved breakpoint management and integrated debugging. A resource editor enables programmers to develop Windows resources such as icons and bitmaps. Support for external editors allows developers to plug-in their editor of choice. Finally, there are GUI-building tools for the Mac environment.

In terms of processor-specific code-generation, there are three main enhancements. First, there is an easy to use interface for controlling optimisation levels of compilations. Second, automatic vectorisation of loops for Intel MMX and AMD-K6-2 3DNow!, is provided for advanced multimedia applications. And there is support for Microsoft-compatible



C++ exceptions, enabling the porting of VC++ code to the CodeWarrior environment.

The new C++ features include partial template specialisation, member templates, and partial template function ordering. For Java, developers can compile to the JDK 1.2 Java Language Specification, and there is support for running and debugging on Sun Java 1.1.6 JDK, Apple 2.0 MRJ, and Microsoft VMs.

CW Professional 4 also includes a file comparison tool for the graphical comparison of individual source files or entire folders containing multiple source files without the help of version control software.

CodeWarrior Professional 4 is distributed by Full Moon Software at £299. Academic pricing is £85.50. One free update and technical support for a year are included. Site licence pricing is available.

Finally, two further announcements from Metrowerks. First, there is CodeWarrior for PowerPC Embedded Systems. This will support Motorola's MPC8260 PowerQUICC II processor. Secondly, Metrowerks is to partner 3Com to support Palm Computing Platform developers: 3COM will market CodeWarrior for Palm Computing Platform as a 3Com-branded product.

www.metrowerks.com

The web-enabling of legacy apps is provided by a **Java** version of Lincoln Software's application development tool, **Engineer** for CICS. As well as 390 CICS systems it works with **CICS** on NT or Unix.

www.lincolnsoftware.com

The ComponentSource Escrow Source Code **Service** is aimed at increasing the adoption of component usage. The service entails pre-packaged **component** vendors depositing their source code with ComponentSource, who then act as an **escrow** agent.

www.componentsource.com

Compuware's **UNIFACE** application development environment has been extended with support for **Corba** to widen user choice of component types, and for **Java RMI** for the construction of front-end components. Workflow capabilities have been added.

www.compuware.com

Test smart not hard

Rational Software is to launch PerformanceStudio, a web-based Enterprise Resource Planning (ERP) and multi-tier performance testing system. It uses the concept of virtual user testing, and includes Rational's Robot product for script recording and test management. Four features are highlighted by Rational to improve ease-of-use, accuracy, and scalability of testing: DataSmart Recording, ClientSmart Pacing, LoadSmart Scheduling, and ServerSmart Playback.

DataSmart Recording automatically generates test scripts using variables and binds those variables to actual test data sets. The resulting test scripts, when played back, can feature unique data for each virtual user. ClientSmart Pacing attempts to ensure the closest possible reproduction to 'live' application performance by differentiating delays of user 'think times', CPU processing issues, and server response times. LoadSmart Scheduling provides the graphical modelling of complex, multi-user scenarios. It turns individual scripts into schedules that can be scaled from ten to ten thousand users without changing any of the scripts or the workload description.

Finally, ServerSmart Playback provides the means to capture server response when playing back dynamic web page content.

PerformanceStudio supports system performance testing for web servers from Netscape, Microsoft, Apache, and Sun.

www.rational.com

RAD SQL SDK

The Pervasive.SQL Software Developer Kit is a collection of RAD resources, including I*net Data Server, ActiveX controls, a Java Native Interface (JNI), and support for all major Windows development environments. The collection is designed to speed the development of applications based on Pervasive's embedded database engine.

The I*net Data Server provides a direct connection to Pervasive-based data over the Internet, intranets, or extranets. This connection uses the same transactional access method to data as with LAN/WAN-based applications running over the network.

The SDK will be sold for \$149 until the end of the year when the standard price will be \$295.

www.pervasive.com

Superscape claim that Viscape Universal is the industry's first interactive 3D **browser** which allows users to view both VRML97 and Superscape's own SVR files, two of the most common file formats for web-based Interactive 3D. Available for free download.

www.superscape.com

Gemplus, the supplier of **smart** card-based systems, has announced the Gemplus Developers' Program. This includes a website with software for download, FAQs, and APIs. The program will initially focus on **Javacard** (GemXpresso) and web network security (GemSAFE).

www.gemplus.com/developers

Hitting the hotspot

Wick Hill is shipping the latest version of **WRQ's** PC **connectivity** software for IBM mainframe, AS/400, HP, Digital, and **Unix** hosts. Version 7.0, for Windows 95/98 and NT 4.0, provides web-based deployment to transparently integrate host access applications within a browser. www.wickhill.com

Mark 5 of the **NAG** C Library has 51 new functions in areas of optimisation, operations research, **statistics**, and linear algebra. Fifteen existing functions have been revised to make the new **library** thread safe. www.nag.co.uk

NAG has also released the high performance Fortran **SMP** Library for SMP Intel/NT Workstations. The **library** of numerical and statistical software routines has been optimised for the Compaq Digital Unix AlphaServer and Silicon Graphics Origin 2000. www.nag.co.uk

Single Step Solutions for **Java**, from Software Development Systems, is a development toolset for Java, covering the life cycle for an **embedded** system. As well as design specification and hardware/software integration, it provides source level debugging support for **FastJ**, the Java cross-compiler developed by Diab Data. 01442 876065

Button ObjX 2.0 from FarPoint Technologies is an upgrade from **ButtonMaker 1.0**. It replaces the Windows button control and allows you to tailor a user interface. In addition to visually enhanced buttons, the control can create customised active buttons and toolbars as well as custom-shaped containers. Pictures and shapes can be dynamically changed and multiple hotspots can be inserted within the custom-shaped area.

Features of **Button ObjX 2.0** include the ability to create up to 512 cells or regions per button, where each cell can contain text, pictures, act as a hotspot, be transparent, or display 3D effects. It displays a ToolTip with customised text for when the



cursor is over a control using customised or pre-defined shapes.

The control costs £140 from Contemporary Software. It in-

cludes **ButtonMaker** Plug-ins, containing over 150 pre-defined buttons, and example code.

www.contemporary.co.uk

Site management integration for HoTMetal

HoTMetal PRO 5.0, is the HTML development tool from SoftQuad. There is an improved three-view approach to editing HTML pages, integrated site management tools, a Resource Manager including DHTML support, a new UI, and validation checks for specific versions of HTML.

The three editing views offered are WYSIWYG, Source Code, and Tags On. The first mode, for quickly prototyping pages with automatic generation of HTML, has been improved for version 5.0. The HTML Source view has added features such as automatic tag completion, syntax colouring for HTML and JavaScript, and automatic source layout. Lastly, the Tags On view lets users view and edit both

a page's layout and HTML code in the same interface.

In this version the site management tools are integrated within the application and include easy site navigation and the checking and management of links. An FTP client provides one-button publishing to single or multiple servers.

The Resource Manager, the next generation of FX Chooser incorporated in version 4.0, is a tool with drag and drop support for collecting and managing web effects - graphics, animations, backgrounds, Applets, JavaScript, etc.

For the user interface, the new 'Workbook Mode' makes it easy to switch between documents by clicking on tabs at the bottom of the display. There are customisable

toolbars, floating and dockable windows, and users can modify various workspaces to suit different tasks.

In terms of HTML validation, there is a Check HTML command that will validate documents against all versions of the HTML specification, as well as proprietary tags from Microsoft and Netscape.

Version 5.0 includes the **HoTMetal Power Pack**, which is an off-line development and testing system for the **HoTMetal** Application Server. Using a tags-based markup language, developers can create secure interactive web applications directly within **HoTMetal PRO**. **HoTMetal PRO 5.0** is available for Windows 95, 98, and NT 4.0. It costs £99.

www.softquad.com

Books received this month

Publisher	Title	Author	ISBN	RRP
John Wiley & Sons	Building SET Applications for Secure Transactions	Mark S. Merkow, Jim Breithaupt, Ken L. Wheeler	0471283053	£25.95
Cambridge Uni Press	Developing Business Systems With Corba	Waqar Sadiq, Fred Cummins	0521646502	£29.95
John Wiley & Sons	Fighting Computer Crime	Donn B. Parker	0471163783	£22.95
John Wiley & Sons	Object-Oriented Project Management with UML	Murray R. Cantor	0471253030	£25.95
John Wiley & Sons	The Data Warehouse Lifecycle Toolkit	Ralph Kimball, Laura Reeves, Margy Ross, Warren Thornthwaite	0471255475	£35.50

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Old jokes for old friends

First email, then ebusiness – what's enext? People are sending ejokes like they're going out of fashion, which they are, says Jules.

Time was, on meeting someone at a stylish party, you'd swap phone numbers, or (if you get lucky, and it's that kind of party) addresses. Now, you have no business being at a stylish party if you don't have email, or you're not prepared to use it.

There's nothing really new about email. It's just an electronic version of the old office memorandum – remember those big blue pads, and the envelopes with tacky bits of string on the back, and 'Please reuse this envelope' on the front and space for five hundred different names, though you never saw one with more than about four (who was it who kept stealing them, and what did they do with them?).

The trouble with the memo pads was that they were internal. You couldn't extend the system outside the company you were in, which meant that if you wanted to send a similar, short, external message, you had to mess with the formal letterhead, the *Dear Sirs*, and the proper signature that meant you had to find a decent pen and then clear an island of calm in the middle of a heaving desk so you didn't poke a hole in the paper, and then you had to go all the way to the post office to buy another batch of stamps because the last ones were ruined, and then had to accept yet another call in the middle of the day, clearing another island of calm in the middle of the still-heaving desk to find the telephone, and then cause offence by saying 'Who? What letter? Oh that party! What do you mean, "negatives"?' Thank heavens that companies have seen sense, and installed email.

Email is not a replacement for ordinary mail. It's a bit like telex in that you have very little control over what the recipient sees. There's junk mail, but there's no idea of glossy brochures. There are letters, but there's no letterhead. You can't send loads of stuff to someone, because they simply won't read it, and that means you've got to tell them just what you think they want to hear, and no more. Wonderful system, really. I can't imagine going back to the old way.

Why is it, then, that when I look through my inbox, I find about 2% of the traffic is legitimate, professional stuff? There's stacks of junk mail, of course (I wish I could install a filter on the ISP!), and there's a few subscriptions, and there's the occasional letter from a long-lost or dear-departed. But the majority of the messages (the vast majority, if I measure bandwidth) is jokes. Over here is a file telling me what a mad cow sounds like, over there is a file of one-liners (for example, the football coach who, when told that one of his players got four Fs and a D, said 'I reckon he's spending too much time on one subject'), I've got a song about Bill Clinton and Monica Lewinsky (to the tune of 'Summer Nights' from Grease), yesterday I got an adult version of Tetris, half my friends are emailing me for help with a Mr Potato Head program that was circulating a few weeks ago, and my screen is alive with bouncing sheep. People who would worry about a message of 14 KB, think nothing of sending an amusingly pornographic

avi of 1.7 MB. You'd think that 1.7 MB-worth would be side-splitting, but they rarely are.

These joke files are unlike ordinary emails in a number of respects. First, they're huge – even the text files are mammoth collections. Second, they have cc lists almost as long as the files – people obviously have joke circulation groups. They also all seem to originate from offices rather than individuals. Finally, they have obviously been passed from hand to hand many times – I've had a message with the quotation arrows nested ten levels deep.

People like telling jokes, particularly very topical jokes. The topical jokes show that the teller is connected not just with famous events, but with enough other people to have access to the latest jokes – there's always a rush to tell a topical joke to as many people as possible. People like hearing the jokes for similar reasons. The highly-produced jokes have a connection to high-quality creativity (in a world decorated with 'You don't have to be mad to work here, but it helps' and 'You want it when?' signs, a decent joke is like a breath of fresh air), and whole books have been written about the social function of the dirty joke. Joke telling is, I suppose, a sort of group bonding. Email jokes extend the nature of the group to more like a Christmas card list – you're not forgotten, they say, we are part of the same global group.

But like corporate Christmas cards, the rise of the email joke is eating bandwidth and is creating a voracious appetite for

new jokes. In this environment, the quality of the jokes is bound to decline, repetitions are going to increase, and the few really original jokes are going to be smothered in a welter of unfunny and old ones that few people will bother to read – just like clipart, the day of 100,000 jokes on CD for £25 is rapidly approaching. Even now, when people on the joke distribution lists get together, they select the best of the mass jokes to retell, even though everybody has heard them all. That's because sharing a joke is a personal experience – you can adjust the joke depending on your own and your listener's preferences, and you inject your own personality into the performance.

That mutation in a joke as it passes from hand to hand is part of how a joke works, yet it's absent in mass-mailings. That's why I think, ultimately, the value of the mass-produced and mass-mailed joke will decline, and group circulation lists will be seen not as an amusing perk of the technology, but as yet more junk mail. But I don't think electronic distribution of jokes will cease. On the contrary, I think that once the technology becomes routine and well-used, people will use electronic jokes for the same social purposes they always used manual jokes, and joke distribution will be used as an excuse for gossip and small-talk between geographically-separated friends. ■

Computer programmer, GSOH but 33.6 kbps modem, seeks petite but really good jokes for sharing relationship. Replies to mayhem@jules.cix.co.uk.



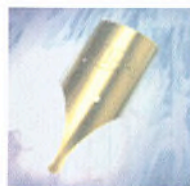
VC++ revisited

Dear Sir,

I read with interest the article(s) on the new version of MS Visual Studio in the September issue, however I have a couple of points to raise on the C++ and VSS components and a couple of questions. I have used MSVC++ V5 for its entire life and have used VSS versions 4 and 5 for over two years in total. I should apologise if the tone of this letter is such that I appear to be a pro-Unix MS-basher, but I would like to see some good tools fulfil their potential and become great tools.

On MSVC, the reviewer did not say whether or not the compiler conforms to the ISO standard. Neither whether or not Microsoft has wrapped the MFC into Microsoft and MFC nested namespaces. Both these issues are, or should be, of interest to the professional software engineer. I'd also like to know if the (IMHO very badly designed) MFC containers have been replaced or remodelled on the excellent STL containers. The quality of the Help in V5 went down hill so much that I resorted to using the help from Borland C++ 5. The removal of links and copious examples was inexcusable. Have they returned, or are the pages on standard C++ still not cross-linked with the MS-extensions?

On VSS, is the new version better at handling network outages, as I had a bad experience with Version 4 that resulted in the complete and total corruption of the VSS repository? I believe this was a direct result of the fact that VSS is a client only (one tier) application – nothing runs on the server other than the file I/O, which is performed by the client. I have found that using a 10-base-T network is far more reliable than 10-base-2 in this regard. Also the documentation for VSS is very lacking in concrete examples of how to manage



multi-developer projects, ie how to get the Makefile (or its binary equivalent) into VSS so that the project build options can be controlled. With SCCS et al in Unix this is so very simple, with VSS/MSVC this is so hard, or am I just being stupid and not seeing the obvious? Either way, I'd suggest that better documentation would help. Furthermore, I'd like to say that the very attractively priced ACCU/Parkway Gordon C++ Forum held in Oxford (again) was very good value for money. I will definitely attend next year. What surprises me is the small number of attendees, given its low price (£90 for two days, including lunch) and high educational content, supplied by world experts. Unlike most, but not all, of the training 'experts' you get in the UK, which in comparison know very little and can't teach either! *Opinionated of Eastergate, Aaron Ridout*
aaron@blackcat.co.uk

C++ was finalised only at the end of July by which time the feature set of Visual Studio was already defined, so it is not (yet) compliant. The MFC has not been wrapped while the issue of MFC/STL is one of coexistence rather than of MFC containers being modelled on STL ones – MFC and STL can be mixed and matched as necessary.

I can't properly answer your question as far as the Help issue is concerned although I did find aspects of the Help structure confusing and incomplete. Essentially Help has been significantly redesigned and extended and is now huge, bringing in as it

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does the MSDN Library. It uses an HTML approach, requires access to the CDs, and it looked as if the final putting together was somewhat hurried. Having said that, there are plenty of samples, example code, and the like – it's largely a matter of tracking down what you need.

The VSS mechanisms haven't fundamentally changed so if you found problems in particular circumstances earlier that's likely to continue. One area which has changed is that of the database format and MS say this should help recovery of data where problems occur. *Murdoch Mactaggart*

We are looking into publishing an article reviewing the compliance of most C++ compilers to the new ISO standard. – Ed.

A changing function

Dear Sir,

I have just got round to installing Windows 98 and NT5 beta 1. I have not yet checked that all our own applications work correctly. However, I happened to notice that one of the features of an app did not work correctly.

We use our own HTML-based help system, which runs as separate application. The main application's MFC code is altered to capture calls to the standard WinHelp system. The request codes are sent to the help application, which displays the relevant page or pop-up help box. The problem in Windows 98 and NT5 was that the page or pop-up box did not appear on top of the main application. Instead, in the pop-

up box case, a flashing entry, appeared in the taskbar, which you had to click to see the help text. Not what was intended.

Eventually I tracked this down to a change in the functionality of the Win32 function `SetForegroundWindow`. The `::SetForegroundWindow` documentation (but not `Cwnd::SetForegroundWindow`) said that in NT 5 (note not W98): 'An application cannot force a window to the foreground while the user is working with another window'. Instead `FlashWindowEx` is called.

Okay, so the call to `SetForegroundWindow` now returns false, but what was I supposed to do. After most of a day's pffing around, I got it to work by getting the main application to call `SetForegroundWindow` with a handle to the help application window.

How many other such problems lie lurking in my (and your) code? A brief search of the MSDN library found no comprehensive list of changes in Windows 98.

People complain (rightly) that Java programs often do not run unaltered in every environment. However, it's the same in Windows too. Now we'll have W95, W98, NT4, and NT5 to check, as well as all the different libraries, controls, browsers, and...

Chris Cant
PHD Computer Consultants Ltd
chris@phdcc.com

At the time of going to press Microsoft could only confirm that this is intended behaviour under NT 5.0. More information is promised for the next issue. – Ed.

Objects *r* Here.

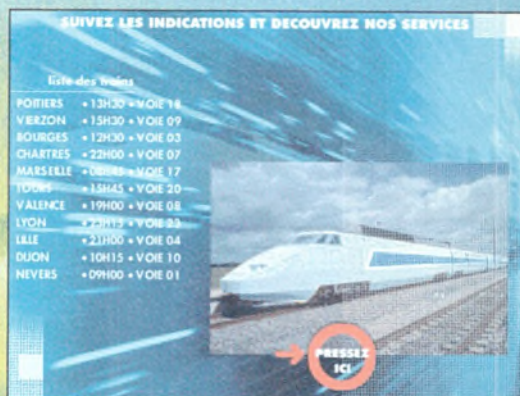
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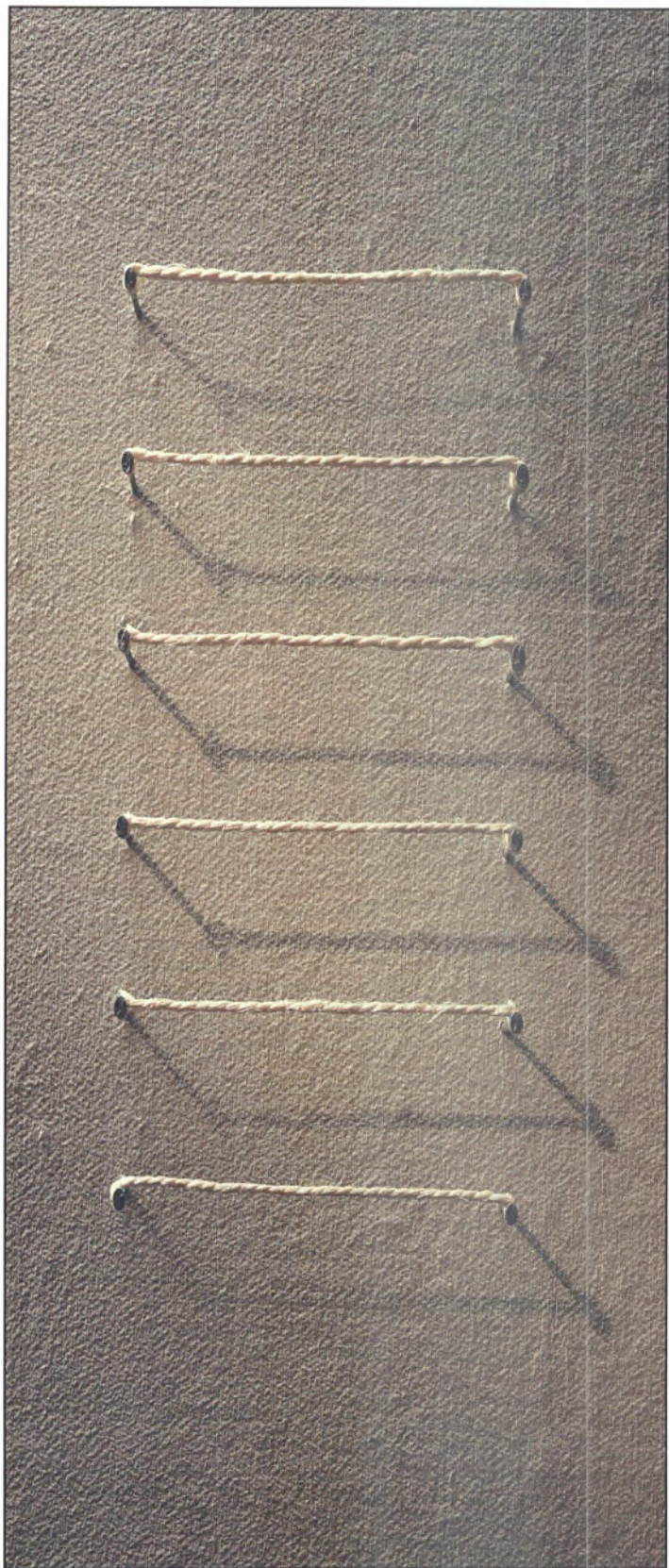
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How long is this going



Project estimation has always been a hit and miss affair. Mark Harman explains some new and established techniques for providing more reliable estimates than 'think of a number and double it'.

In his 1979 Pulitzer-prize winning book *Gödel, Escher, Bach* (ISBN 0140179976, Penguin), Douglas Hofstadter enunciated Hofstadter's Law, which says: 'It always takes longer than you think, *even* if you take into account Hofstadter's Law.'

As many developers know, this could not be more true in the case of software development projects. The ability of software projects to overrun both time scales and budgetary requirements is now so notorious that it hardly bears repetition. Why is it that software projects overrun so often?

Many developers and researchers have addressed this problem, and some factors do appear to be emerging from this soul searching: the importance of clearly specifying requirements is often underestimated; same goes for the technical difficulty involved; often user expectations overestimate what can be achieved in the available time scale; and so on. Most of us are familiar with these explanations. What is it that unifies all of them? The key word that occurs in all these explanations is *estimation*. Estimation is a crucial (and poorly understood) phase of all but the most trivial software development projects.

Typically, before development begins in earnest, someone has to estimate the physical resources required, the staff involved, the project's likely duration, the stages at which milestones can realistically be achieved, and so on. Anyone who has tried to provide reliable estimates of these system dynamics knows how incredibly difficult it is to be precise, and how flimsy is the theoretical support for any decisions and predictions we make. If we need to set an upper bound on the execution of a loop, we wouldn't be so unscientific as to think of a sensible number and then double it to be 'on the safe side', but this is just what most developers and their managers find themselves doing when asked for a prediction concerning a software project.

There are several techniques that can be used to try to provide more reliability in software estimation. The most well-known of these, and that used by most project managers (if they use any technique) is called COCOMO (COConstructive COSt Model). COCOMO is often misused, because it is not carefully fitted to the peculiarities

to take?

of the local software environment. If misused in this way, the predictions it makes are often far worse than 'think of a number and double it'. Fortunately, other more recent cost estimation techniques can offer far more accurate predictions that automatically tailor themselves to the local environment, because they base their estimates on past knowledge in just the same way that a good human estimator would do.

Note that project estimation techniques are useful both to developers and project managers. They provide developers with a sound theoretical basis for arguing against unrealistic project goals and they provide managers with more accurate predictions, upon which planning and risk assessment can be more soundly based.

COCOMO

COCOMO is the name given to a family of three cost estimation systems, developed by Barry Boehm in the late seventies and published in his book *Software Engineering Economics* (ISBN 0138221227, Prentice-Hall). The three COCOMO models are known as the 'basic', 'intermediate', and 'advanced' models. All three calculate the unknown project attributes of effort E (measured in person-months), and duration D (measured in elapsed months). The more advanced models are all based on the simple equations used in the basic model, which are:

$$E = \alpha S^B$$

and

$$D = \gamma E^\phi$$

In these equations, S is the number of lines of code produced (in thousands). The four values α , B , γ , and ϕ are constants for which Boehm provides different values depending upon the kind of software project under consideration. For example, for an 'organic project' (one that involves a small close-knit team of experienced programmers) the values are $\alpha=2.4$, $B=1.05$, $\gamma=2.5$, and $\phi=0.38$. For an embedded project (where the project must be developed in an environment that imposes rigid constraints) the values are $\alpha=3.6$, $B=1.2$, $\gamma=2.5$, and $\phi=0.32$.

It's not too hard to see the logic behind Boehm's equations. For example, consider the equation for E . In this equation, S is simply a crude measure of the size of the project. The equation has two constants (determined by the type of project) α and B . The B constant is perhaps the more interesting of the two. In all three models its value is greater than one, introducing an exponential increase to project effort in terms of the size of the project. That is, as the project gets larger the amount of effort required accelerates, rather than simply keeping pace. This seems logical because larger projects produce diseconomies of scale due to integration costs: two small projects can be completed with less effort than a single project of their combined size.

It is not difficult to see the appeal of the COCOMO model to project managers. All that is required is to decide what kind of project is to be undertaken (for example, organic or embedded) and to plug in the value of S , and then *magically* the effort and duration of the project will simply 'drop out' of the COCOMO model. Unfortunately, reality is often not as simple as this.

Problems with COCOMO

Barry Boehm formulated the COCOMO model based on a set of projects for which he had access to project data. Many people have applied the technique and found that the basic shape of the graph denoted by the COCOMO equations is borne out. However, the precise values of the constants α , B , γ and ϕ , can vary widely, depending upon the development environment. This evidence suggests that while the equation may be valid, the constants need to be 'tuned' to the development environment. After all, Boehm's original values were inspired by the study of projects carried out almost a quarter of a century ago, and a lot has changed in the software development industry since then!

There is another problem with the equation itself, which cannot be overcome by tweaking the value of the constants. In order to work out the required effort for a project, we need to know the *size* of the project. Unfortunately, knowing the size of a project is half the battle. If we knew how much code would be required by an implementation, we could probably provide a reasonable estimate for how long the implementation would take. Even if things were a little more complicated, and we had to predict how long a team of developers would take to produce a certain number of lines of code, we could probably produce a reasonably reliable estimate. When he introduced the COCOMO models, Boehm said that one could only reasonably expect an estimate within 20% of the real value and that we could only expect this 70% of the time. In reality, even this 'estimate of the power of estimation' has proved to be optimistic. Empirical investigations of estimates produced by COCOMO and similar formulaic estimation systems show that estimates based on these formulae could, in the worst case, be out by as much as several hundred percent. Not very reassuring when our livelihoods could depend upon estimation precision.

Finally, there is a problem with the way in which software size is measured. Using the number of lines of code as a measure of size is rather arbitrary; 1000 lines of Java will probably go a lot further (that is, will represent more functionality) than 1000 lines of, say, Z80 assembler code. The weakness of code length as a measure of system size has led to an increasing uptake in 'function points' as an alternative measure, but function points are far less rigorously defined than lines of code, which introduces additional problems.

While the COCOMO method has provided developers and project managers with a much-needed handle on the problem of cost estimation, it has required a great deal of 'tweaking' to suit particular development environments and, even with this adjustment, it remains a tool for relating effort and duration to project size. Since its introduction in the early eighties, the COCOMO method has remained the principal technique used by project managers to estimate project costs (apart from intuition and luck, that is). While COCOMO is attractively simple, it would be wise to use it only to decide upon best- and worst-case scenarios, rather than to use it to calculate precise predictions of project attributes.

More recently, new models for cost estimation based on Artificial Neural Networks (ANNs) and Case-Based Reasoning (CBR) have been developed. These techniques automatically tailor themselves to the development environment concerned and allow us to predict *any* set of unknown project attributes in terms of a set of known project attributes. While these new techniques are less well known than COCOMO and other formulaic techniques, their flexibility and adaptability make them extremely attractive.

Neural networks

An Artificial Neural Network is a model (usually in software) of the workings of the human brain. It is currently far too demanding to



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expect an ANN to achieve the power, flexibility, and creativity of human intelligence, though this remains the dream of some enthusiasts. Currently achievable ANNs contain many orders of magnitude fewer components than the human brain. For example, it would take approximately 1% of all the RAM chips in existence to provide sufficient memory capacity to equal that of a single human brain. Although the replication of human intelligence is a far-off goal for the ANN research programme, more modest attempts to model simple brain-like pattern matching in particular domains have been far more successful. This work has demonstrated that ANNs are good at recognising patterns in data, and almost all applications involve some formulation of a problem in terms of pattern matching. Fortunately, many problems, including that of predicting software project attributes, can be reformulated in this way.

The network itself consists of several layers of neurons, each of which takes inputs from other neurons in the network and provides outputs to other neurons. Essentially, each neuron 'fires' its output connections if the sum of its input connections rises above some specific 'threshold value'. The determination of the threshold values and the connectivity of the network of neurons determine the way in which the network will recognise patterns.

Usually, a fixed network configuration is chosen, while the threshold values are determined by 'training' the network with a set of well-understood patterns. A typical configuration involves an input layer, an output layer, and one or more 'hidden layers', which ultimately feed input through to the output. The input to each neuron in the input layer comes from the outside world. In the case of project estimation the input will be the values of known project attributes. The output from the output layer is the result produced by the neural network. For project estimation, the output will be the predicted values of unknown project attributes. Information propagates through the network from the input neurons to the output neurons, with the threshold values determining the relative significance of different subsets of input combinations.

The network is taught to recognise patterns in data during a training phase. This involves providing the network with input values for which the corresponding output value is known. The desired result is then 'back-propagated' from the output nodes through the intermediate nodes to the input nodes. The threshold values are modified to encourage the network to produce the right output for the input supplied: the threshold values come to represent patterns in the data.

Having taught the network to recognise these patterns, it can be used to predict the likely output that will occur for a known input. In the case of project estimation, we can train the network to recognise patterns in past projects and to provide predictions based upon these for future projects.

Unfortunately, it is possible for the network to overemphasise the importance of certain attributes; essentially, the network is seeing false patterns in the data. ANNs are designed to mimic human brains and, just like human brains, the network can produce wildly inaccurate answers, due to arbitrary biases, based on the natural selectivity of past experience. There is also a problem in understanding the behaviour of the network; even if it produces good estimates, we don't really understand *how* it does so. In some applications of ANNs this is not an issue, but in the case of project estimation it is often important to know *why* and *how* as well as *what*. For example, we shall want to know not just *what* the length of a project will be, but *why* it will last that long and *how* it could be changed to reduce this length.

Until these problems can be addressed, developers may prefer to use human brains to produce answers rather than silicon replicants.

If we need to set an upper bound on the execution of a loop, we wouldn't be so unscientific as to think of a sensible number and then double it.



However, ANNs remain an exciting and unconventional model of computation. It could simply be that our understanding of their operation is too meagre, or that the network size which we have hitherto been capable of constructing is of 'sub-critical mass'. The technology cannot be written off for the future; we might yet see the day when project managers' brains are replaced by silicon implants. Oh brave new world, that would have such people in it!

Case-Based Reasoning

When asked to provide an estimate as to how long an implementation will take, or how much time will be required for testing, most of us will use intuition, backed up by previous experience. This exploitation of previous experience is an example of Case-Based Reasoning (CBR). That is, we base future predictions on knowledge of past cases. Recent research by Professor Shepperd's group at Bournemouth University has created a new automated approach to case-based estimation of project attributes. The approach is very successful in providing accurate estimates because they are based on prior knowledge and are tailored to take account of an organisation's development environment.

Before the approach can be applied, a database of previous project attributes needs to be created. The estimates will only be as good as the quality of the data collected, and so disciplined and structured data collection is essential. Of course, this is also true of the ANN approach and, if we are to tweak it, of the COCOMO technique too.

Collecting data about projects is often regarded as a bit of a chore. It is disliked by developers because the data often goes unused, or worse, is used in a pejorative way, to evaluate programmer productivity. This is a shame, because without reliable data about previous projects it is hard to learn from them. Fortunately, project estimation using CBR uses prior project data in a different way to other techniques. Using CBR, it is more likely that the data will support the developers' view of the project than oppose it, because CBR respects and takes account of previous development history.

The approach is essentially a codification of common sense. We try to find the set of projects conducted in the past that most closely resembles the one upon which we are about to embark. The approach can be applied equally well to whole projects or to individual project steps, such as the implementation of a GUI, or a port from one language or platform to another. In this way, the idea of case-based estimation is useful to both developers and to managers. Because the estimates are tailored to the development group concerned, they do not provide impossibly ambitious goals imposed in a top down fashion. Instead they provide realistic estimates of the likely attributes of a project.

Of course, the response to an unacceptable estimate may be: 'well, it will have to be completed in half that time', or 'we simply can't devote that many developers to this phase of the project'.



Two small projects can be completed with less effort than a single larger project the size of both.

Case-based estimation can, at best, provide a realistic estimate. It cannot make the problems of short time scales and scarce resources evaporate. However, what it *can* do in this situation, is to provide a clear prediction of just *how* unrealistic a project's goals are. This prediction will be soundly based on previous project profiles and so it will provide the developer with a stronger case for arguing for additional resources and/or for modifying the expectations of the project manager or user. From a managerial perspective, it is obviously important to know just how hard the team is being driven or (in the utopian world) just how much slack the manager has been able to create.

Collecting previous project data

Suppose we have collected information about some previous projects and stored this in a simple flat-file database. Suitable data will concern any attribute of the project that can be measured on a numerical scale. At first sight, this will include properties such as the size of source code used, the number of different files created, the volume of documentation, the number of developers, the duration to completion, the number of bugs reported, and so on. This data is readily available as most projects proceed; we simply need to devote (a little) extra time to its collection.

It is possible to record more qualitative project data by scaling 'enumerable' project attributes, for example the platform on which development took place, the customer for whom the project was developed, and so on. We can record even more 'soft' attributes, by simply trusting expert knowledge to determine parameters such as the maintainability of the system and the readability of its documentation.

All of these attributes are recorded on a normalised scale (usually as a real number between 0 and 1). When estimating how a new project will progress some of the attributes we record will be more important than others, but it is easy to get the case-based approach to take account of this, as we shall see.

Estimating the project attributes

To simplify the situation, let's suppose that we have stored five project attributes: S (the source code size in thousands of lines of code), N (the number of developers), D (the duration in months), L (the number of languages used), and F (the number of files created).

Imagine that we are about to start a new project. We know how many languages will be involved, how many developers will be available, and the number of files that are to be created, and we want to predict the duration of the project and the number of lines of code that will be written. Our estimate will be based on finding the project's *nearest neighbours* in three-dimensional space. The dimensions are the three dimensions for which we know the real project values: N , L , and F . Having found a set of nearest neighbours we use these to provide our estimate of the new project's unknown parameters.

To find the set of nearest neighbours we use 'Euclidean distance'. This is a simple formula for determining how far two points are from one another, based on the famous Pythagorean rule for calculating the length of one side of a triangle in terms of the lengths of the other two sides. The rule generalises to an arbitrary number of dimensions, so it does not matter how many project attributes we have.

In using the nearest neighbour set to determine the estimate for new project attributes we have several choices. The simplest approach would be to take some number of projects, say five, and to estimate the unknown parameters as the mean of the corresponding known parameters for the five neighbours. This technique suffers from two problems.

First, while a neighbour might be in the nearest five, it may still be a long way off relative to the other four. Second, for some particular unknown attribute, some of the remaining attributes may be poor predictors, merely adding confusing noise.

To remedy the first problem we simply need to identify a weighting to apply to previous projects based upon how far they are from the new one. A close project will contribute far more to the estimate than one far away. If we allow weights to be zero, then we can think of the neighbourhood as containing all projects, simplifying the model further.

To remedy the second problem, we need to conduct some refinement of the model. We can 'jack-knife' the project set, by taking out a single project. If we 'throw away' one of the project's known attributes, then we can see how good the system is at predicting the 'unknown' attribute of the jack-knifed project. By trying all the different subsets of attributes and jack-knifing on each project in turn, we can determine the best predictors for each attribute.

CBR remains the subject of on-going research. More information, and a tool called ANGEL for case-based cost estimation, can be found at the Bournemouth University Empirical Software Engineering Research Group (ESERG) website (<http://dec.bournemouth.ac.uk/ESERG>).

A fear of accuracy

Estimating project attributes remains more of an art than a science. However, like all arts there is room for some training and for firm foundations. The evidence strongly suggests that no 'off the peg' estimation technique will ever be found; software projects are too diverse and complex to submit to such a crude approach.

Formulaic approaches to estimation, like the COCOMO technique, can be used to quickly determine 'ball-park' figures for project effort and duration, but more sophisticated (and accurate) answers can be obtained from techniques that base their estimates on local historical data. These techniques may provide better estimates, but require that we face up to the chore of collecting project attribute data.

Estimating the attributes of a software project more accurately will be of benefit to both developers *and* their managers. Only competitors have anything to fear from more accurate cost estimation. The techniques described in this article are not a threat to developers or their managers; at worst, we will be in a better position to say just *how* unrealistic our project goals are. ■

Mark Harman is a lecturer in computer science at Goldsmiths' College, where he works on software development, testing, slicing, and evolutionary algorithms. He provides consultancy on development and testing issues and acts as an IT recruitment advisor. Dr. Harman can be contacted by email at m.harman@gold.ac.uk, or by post to Department of Mathematical and Computing Sciences, Goldsmiths' College, University of London, New Cross, London SE14 6NW.

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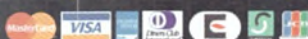
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Active Server Pages tricks, traps, myths, and magic

Neil Hewitt gives a few pointers, advice for avoiding pitfalls, and explodes a few myths about Microsoft's script-based web application development technology.

Active Server Pages is a very misunderstood technology. Those who use it rarely understand everything about it, and those who don't usually object to it on grounds which, on closer examination, turn out to be specious. To a large extent, this has to do with the lack of detailed information about ASP outside the dedicated Microsoft community, and the relative paucity of documentation on ASP beyond the bare-bones function and method listing in the online help. There are a number of books on the subject, and websites dedicated to ASP development, but the budding developer often doesn't find out about these until he or she enters the 'inner circle' and actually does some work with it. This is a shame, because ASP is one of the coolest things to come out of Redmond since Visual Basic.

Since the current EXE OnLine site is written almost entirely in ASP, I thought it might be helpful to set down on paper a few of the coding techniques that I uncovered or invented during that process, as well as exploding a few of the myths that surround the subject. I can't promise that every ASP guru would agree with all these suggestions, but I can promise that they have all worked well for us at EXE in the past year.

Tricks

Trick: Use the server objects

No one wants to re-invent the wheel. ASP installs with a variety of server objects that make life a great deal simpler, so use them. In particular, you can get good use out of the `request` and `response` objects. These contain information received from, or to be sent to, the browser. Data posted from an HTML form to an ASP page is contained in the `request` object, for example.

Most ASP developers are familiar with using the `response.redirect` method to force the browser to load a different page. However, using the `response` object you can also set cookie values, using the `response.cookies` collection, turn off page caching with `response.expires=0`, or write data directly into the HTML stream using `response.write`.

One hidden facet of the `request` object is the `servervariables` collection. Accessed with the syntax `request.servervariables("VARIABLE_NAME")`, this collection gives ASP access to a number of useful pieces of information about the user, browser, and page requested. For example, the expression `request.servervariables("HTTP_USER_AGENT")` returns the browser ID string. The following code displays to the user their browser type (assuming it's Netscape or IE, that is), IP address, and host name.



```
<%
UserAgent=request.servervariables("HTTP_USER_AGENT")
IPAddr=request.servervariables("REMOTE_ADDR")
HostName=request.servervariables("REMOTE_HOST")

if instr(UserAgent,"MSIE") then
    BrowserType="Internet Explorer"
elseif instr(UserAgent,"Mozilla/") and not
instr(UserAgent,"compatible") then
    BrowserType="Netscape Navigator"
else
    BrowserType="Other Browser"
end if
%>
Your browser is <%= BrowserType %>. Your IP address is
<%= IPAddr %>.
<% if HostName<>" " then %>Your hostname is <%= HostName
%><% end if %>
```


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Trick: Use inline ASP

A bit controversial, this one. Many otherwise sane ASP developers froth at the mouth at the mere mention of inline ASP. For the uninitiated, inline ASP is code delimited by the special tags `<%` and `%>`. The code within the tags is evaluated and executed at that point in the page. An ASP expression is placed within the special tag form `<%= expression %>`; the results of the expression are written into the page at that point.

Although many developers use this style all the time, it is in fact only a shorthand. The original ASP specification (which referred to the technology as 'Server-side Visual Basic Scripting' – probably the source of many people's prejudice that ASP is a VBScript-only technology) required ASP code blocks to be enclosed within `<SCRIPT>` tags like client-side script. A new attribute, `RUNAT`, was devised to differentiate client-side from server-side script. The tag `<SCRIPT RUNAT="SERVER">` indicates the start of a script block that runs on the server side as ASP code.

The aforementioned frothing-at-the-mouth developers tend to believe almost religiously in the `<SCRIPT>` tag, and in total separation of script and HTML. Take the following example:

```
<table><tr><td>First name</td><td>Last name</td></tr>
<%
set dbrs=db.execute("SELECT FirstName, LastName FROM
Users")
while not dbrs.EOF
%>
<tr><td><%= dbrs("FirstName") %></td><td><%=
dbrs("LastName") %></td></tr>
<%
wend
%>
</table>
```

which, in orthodox ASP, would have to be written as

```
<SCRIPT RUNAT="server" LANGUAGE="VBScript">
set dbrs=db.execute("SELECT FirstName, LastName FROM
Users")
response.write("<table><tr><td>First name</td><td>Last
name</td></tr>")
```

```
while not dbrs.EOF
response.write("<tr><td>")
response.write(dbrs("FirstName"))
response.write(dbrs("LastName"))
response.write("</td></tr>")
wend
response.write("</table>")
</SCRIPT>
```



Inline ASP is usually simpler, and in some cases allows you to achieve effects you couldn't otherwise manage. Take conditional HTML. This is where you want different sets of HTML to be output depending on a condition, for example, the browser type. To achieve this effect with orthodox ASP syntax you would need to write your entire page as an ASP script, with `response.write` for every fragment of HTML. With inline ASP, conditional HTML becomes as simple as this:

```
<% if IE then %>This is Internet Explorer<% elseif NS
then %>This is Netscape Navigator<% end if %>
```

The other main reason for using the inline syntax is that it's much, much easier to tell the difference between client-side and server-side script blocks if you have both on your page.

Tip: Use server-side includes

If you ever did any real programming in C, you'll remember the endless stream of `#include` directives you had to put at the top of the main source file. As inconvenient as it was to remember all those includes, having the defines and function prototypes in separate files made things a whole lot simpler. ASP has just such a mechanism, almost like a C preprocessor. It's called Server-Side Includes (SSI).

SSI actually existed a long time before ASP – from the earliest days of HTTP, in fact. It defines a bunch of special instructions, enclosed within normal-looking HTML comment tags, that cause the server to perform some kind of action on the HTML before serving it up to the browser. The only SSI instruction that really matters to the ASP developer is `#include` (sound familiar?), which causes the content of the specified file to be inserted into the HTML source at that point. The syntax for an `#include` directive is:

```
<! #include virtual="yourfilename.html" >
```

```
<%
function SetSessionVar(ByRef SessionKey, ByRef VarName, ByRef Value)
    set db=server.createObject("adodb.connection")
    db.open("MyServer")

    set rs=db.execute("SELECT Value FROM SessionDB WHERE
SessionKey='"+SessionKey+"' AND VarName='"+VarName+"'")

    ' if no results from the above query, we need to create a new record
    ' else update the existing variable

    if rs.EOF and rs.BOF then
        sqlstring="INSERT INTO SessionDB (SessionKey, VarName, Value) VALUES
("
        sqlstring=sqlstring+" '"+SessionKey+"', "
        sqlstring=sqlstring+" '"+VarName+"', "
        sqlstring=sqlstring+" '"+Value+"') "
    else
        sqlstring="UPDATE SessionDB SET SessionKey='"+SessionKey+"', "
        sqlstring=sqlstring+" VarName='"+VarName+"', "
        sqlstring=sqlstring+" Value='"+Value+"'"
    end if

    db.execute(sqlstring)
    rs.close
    db.close

    SetSessionVar=True
end function

function GetSessionVar(ByRef SessionKey, ByRef VarName)
    set db=server.createObject("adodb.connection")
    db.open("MyServer")

    set rs=db.execute("SELECT Value FROM SessionDB WHERE
SessionKey='"+SessionKey+"' AND VarName='"+VarName+"'")

    ' if no results return FALSE
    if rs.EOF and rs.BOF then
        GetSessionVar=False
    else
        GetSessionVar=rs("Value")
    end if

    rs.close
    db.close
end function

function DeleteSessionVar(ByRef SessionKey, ByRef VarName)
    set db=server.createObject("adodb.connection")
    db.open("MyServer")

    set rs=db.execute("DELETE SessionDB WHERE SessionKey='"+SessionKey+"'
AND VarName='"+VarName+"'")

    DeleteSessionVar=True
end function
%>
```

Listing 1 – Keeping session variables in the database.

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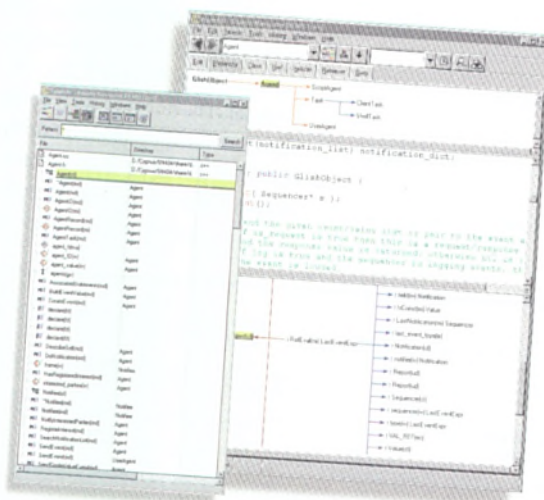
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The `virtual`, by the way, specifies that the path to the file is a virtual one, relative to the root of the site, not the filesystem. You can specify a filesystem path if you prefer by substituting the keyword `file` for `virtual` in the `#include` directive. Be aware, however, that with the `file` keyword the path is still relative, but relative to the filesystem structure rather than the site structure. In practice, you should only ever need to use `virtual`.

With SSI, it's easy to package up often-used pieces of ASP script, especially functions or procedures, into separate files. You can build up libraries of script code and include them into pages where necessary. This has two advantages. First of all, it reduces the size and complexity of your ASP pages. Second, making a change to an included script file automatically affects every page that uses that file.

Trick: Do it by hand

If you happen to use Visual InterDev 6.0, or any of the other 'visual' ASP tools out there, you might easily be seduced into using the handy design-time controls for building data connections and retrieving recordsets. I suppose the idea is to bring the concepts of RAD – which, even in nominally non-RAD tools are pretty much everywhere these days – to scripting. Don't be seduced by the Dark Side. Writing your code by hand always produces better results than relying on generated ASP. Undoubtedly, this has to do with the relative immaturity of products like InterDev, and of ASP as a technology. The time may well come when 'Visual ASP' is a realistic possibility, but that time is not yet here.

The price you pay for doing things visually is a huge lump of code that takes significantly longer to execute and places more strain on your server. You might also notice that this code includes some functions from the ASP Script Library as well, which will make the final amount of script code even larger. In this case, less really is more.

Traps

Trap: Be careful with quotes

If you use ASP against SQL Server, or any other SQL-compliant DBMS, there can be a nasty problem with quotes. Assuming you use the `execute` method of `adodb.connection` to run SQL commands directly on the server – this is a very common way of doing things because it has far less overhead than using recordset objects or DTCs directly – you will need to pass the SQL command as a string.

Where it would normally be necessary to use double quotes in a SQL statement – around the string 'Joe Bloggs' – in ASP single quotes are used because the command string itself is enclosed in double quotes. This is generally fine, but consider the following code:

```
db.execute("SELECT * FROM Table WHERE Name=' ' &
UserName & ' '")
```

Here, the variable `UserName`, a string, contains the name of the user to select on. The value of `UserName` is inserted into the command string, then sent to SQL server for evaluation. Suppose, however, that the name in question was Mike O'Leary? The final string sent to SQL Server would be:

```
SELECT * FROM Table WHERE Name='Mike O'Leary'
```

which would result in an error, because the single quote in the middle of the name is taken as the end of the string.

The solution is to replace all instances of the single quote (and, just to be on the safe side, the double quote) before passing it, like this:

```
UserName=replace(UserName, "'", "'")
UserName=replace(UserName, "\"", "\"")
```

This replaces all instances of the single quote with two single quotes (this escapes the single quote), and all instances of double quotes with two double quotes.

Trap: Don't handle dates directly

It's not uncommon for ASP scripts to have to handle dates entered by the user, or pulled from a database. For example, EXE OnLine's databases are full of dates, specifying the start and end dates of content on the site, or the date that users registered. It becomes tempting to handle these dates as strings. After all, variables in ASP are variants, so date and string are interchangeable. Give this temptation a wide berth.

Many ASP applications are deployed on the Internet, rather than in the secure environment of the Intranet. There's no easy way for the developer to know what format of date the user will have set up on their PC, and by extension, his browser. For instance, many countries specify the date in MM/DD/YY format. The Japanese specify it in YY/MM/DD format. Let ASP handle these problems for you. In VBScript (and in JScript as well) there are a number of functions for handling and splitting dates. The `month` function, for example, returns the number of the month from a given date. The expression `month(date)` will return the number of the current month. Just to make life even easier, the function `monthname` returns the name of the month. Similar functions exist for days (`day`, `weekdayname`). These functions take account of the language settings on your web server, so you will always retrieve the correct value as long as you have the dates stored in the right format. You can therefore present them in a way that overseas users can understand, ie '10 January 1999' instead of '10/1/99', which would mean 1 October 1999 to someone in the US.

Trap: Don't assume the session object will work

If an application is to be deployed on the Internet, you should avoid using the session object to store information between pages. Although this is precisely what session was intended for, it's perfectly possible that the information will, in fact, be lost. Session depends on the availability of cookies on the client browser. Although session cookies are just that, ie non-persistent, if cookies are turned off completely in Netscape or certain other browsers, session will not work. On IE, by contrast, session works even with cookies turned off, because the browser maintains a temporary session cookie store regardless of user settings.

If you absolutely need to be able to transfer information on a per-user basis between pages, try using a database record. Assign the user a session key (this can be any old unique number, as long as it is unique – my favourite method is to assemble it from the precise time and date the operation started) and store this, together with your session variables, in a database table. Call the next page in the form `<a href="/mypage.asp?session=<%= yoursessionkey %>">` and make sure all the links are written this way. Each time a page is called by the user, all the links will be formed with the session key in them, passing it to each successive page, where if necessary the session variables can be retrieved from the database using the key. The code in Listing 1 demonstrates this.

Myths

Myth: If you use ASP, you have to use VBScript, which isn't as good as JavaScript.

This is an oft-quoted objection to ASP, rooted (apparently) in the misconception that Microsoft wants all developers to use VB, or its scripting cousin. In fact, ASP is entirely language-neutral. At the back end of every ASP implementation is an ActiveX Scripting Engine (ASE), a script interpreter which also provides the engine for the Windows Scripting Host. The specifications for the ASE are published, so that anyone who cares to can write an interpreter for their favourite brand of scripting language and use it for ASP. Any ASE language must be able to





instantiate and call COM objects, but the APIs for this are supplied by the ASE. Several major languages have already been ported to the ASE, most notably Perl, REXX, and Python. The version of ASP installed with Internet Information Server (IIS) includes both VBScript and JScript, the two most common languages.

The contention that VBScript is 'not as good' as JavaScript is one I would also take issue with. The argument that it is inferior because it's a Microsoft invention and not supported by Netscape or Sun et al holds weight only when talking about client-side scripting. On the server side there is no such thing as 'cross-platform'. Many people seem to assume that JavaScript is related to Java and thus includes all the usual Java goodies like true object orientation. This isn't true; JavaScript is actually a purpose-built scripting language with a syntax based originally on C/C++, and only dubbed JavaScript when Netscape, its inventors, realised that interpreted C without pointers looked remarkably like Java and decided to jump on the Sun bandwagon by licensing the name.

It seems to me that which language you choose to use with ASP is a matter of personal preference and experience. If you already know and understand the cryptic syntax of C, you will probably prefer to use JavaScript. If you know VB, you will find VBScript easier to handle. Both can do just about anything the other can, and both are good general-purpose languages.

Myth: ASP doesn't perform as well as CGI

This old chestnut tends to come out in any discussion about why Microsoft chooses to run its Hotmail service on Unix servers with cus-

tom code rather than on NT with ASP, or why some of the web servers at Redmond turn out to be Unix boxes running Apache. The argument is that interpreted code is always going to be slower than compiled code written for the purpose. Proponents of this argument haven't thought too much about the overheads of the Common Gateway Interface.

CGI has two major disadvantages – it doesn't have any concept of state, and each CGI request must start a new instance of the program. On a system getting tens, possibly hundreds of CGI requests a second, that means an awful lot of instances. It's also quite difficult to get standard CGI programs, which are essentially simple console programs taking standard input and writing to standard output, to do anything more sophisticated – like talking to back-end data sources – without having to bring in a whole host of third-party libraries, which in turn add overhead to each of the many instances. This is not to say that you can't overcome most of these disadvantages by, say, putting most of your application code into a shared DLL, but most developers have now recognised that CGI has inherent limitations and are instead writing their own application servers.

In this context, 'application server' means an ISAPI or NSAPI program, written to a much more comprehensive API than CGI. ISAPI programs have the advantage of being single-instance, thus avoiding massive memory overheads, and can take advantage of all the services normally available to an NT application including Transaction Server and ODBC or ADO data access. If you're writing a large, mission-critical distributed application using HTTP as a transport mechanism, then you will probably want to write the transport layer as an ISAPI application server. If your needs are smaller, ASP – which is itself simply an ISAPI filter – should suit you nicely. Provided your code is effi-



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cient and doesn't contain any bottlenecks, you should find that under load, ASP performs better than all but the smallest of plain CGI efforts.

Myth: ASP is insecure

This myth came about when it was revealed that, by adding a full stop to the end of an ASP URL (for instance, 'www.microsoft.com/default.asp.') it was possible to see the full source code for the page. Ordinarily, you won't see any ASP code in the page returned to your browser, because all the ASP code is stripped out at the preprocessor level. In fact, this was not an ASP bug at all, and it wasn't limited to Windows NT either. Adding a full stop to the URL effectively changes the file extension, and by default, if a file is marked as readable (which all HTML files have to be), the web server will send it as plain text if it doesn't recognise the extension. This would apply equally to any of the server-side scripting packages, Cold Fusion included.

A similar scare came about when someone discovered that by adding :\$\$DATA to a URL it was possible to read the source of ASP pages. As it turned out, this is an underlying feature of the NTFS file system, which has multiple stream types. Specifying the \$\$DATA stream caused the file type to be ignored, and again the default behaviour resulted in the full page source being pushed to the browser.

The truth is that ASP is as secure as your server. There is a great deal the server administrator can do to prevent unauthorised access to the ASP files. Occasionally, bugs are discovered in NT or IIS, just as they are in Unix and Apache. If absolute protection of the source code is a must, there are limited code obfuscators available.

Myth: ASP only runs on NT with Microsoft's web server

Not true. Versions of ASP for other platforms and servers exist, although they are not published by Microsoft. ChiliSoft (www.chilisoft.com) has versions of ASP for Netscape and Lotus web servers on NT, and Netscape servers on Solaris, with promises of more to come.

So where's the magic?

There are many sources of information about Active Server Pages on the Web. In particular, I would recommend the ASP Alliance (www.aspalliance.com), 15 Seconds (www.15seconds.com) and, despite its dubious name, the ASP Hole (www.asphole.com). For web development in general, CNET's Builder.com (www.builder.com) is a great starting point. I would also encourage web developers new and old to frequent the forums at Builder Buzz (buzz.builder.com) and on Usenet (microsoft.public.inetserver.iis.activeserverpages) and pass on their experience to others.

For those developers who are prepared to look past the myths and the mudslinging of those who have an axe to grind against NT as a server platform, or Microsoft in general, ASP is an easy route to sophisticated and interactive web applications. Like anything else, it's not a one-size-fits-all solution, but it is applicable to many of the more common web programming tasks, and uses your existing skills rather than requiring you to learn new ones. What's really missing from the ASP community right now is agreed standards and best practice guidelines. With any luck, passing on and collecting as many tricks and tips as you can will help make better web developers out of us all. And as Paul Daniels would almost certainly say, that's magic. ■

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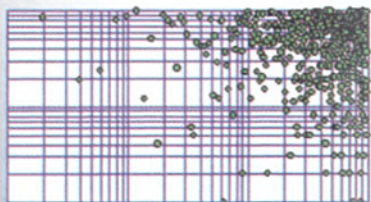
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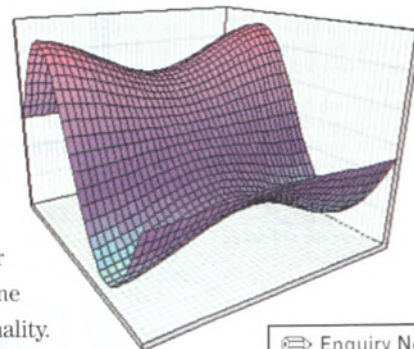
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Managing a web of change

Andrew Ward checks out the benefits of putting a website under the change management control of Continuous/WebSynergy.

With the publishing tools available today, it's all too easy for anyone to create and deploy a small website. Unfortunately, that small site is unlikely to stay small, and once you get more than a few pages you have a problem that programmers are all too familiar with: change management. Even small websites are complex systems, and just the idea of a website left in the hands of amateurs will horrify many who are used to programming in formal, controlled environments.

Furthermore, the use of perl, CGI, ActiveX, Java, JavaScript, and so on has turned the management of websites into a programming problem (although pure HTML sites are bad enough). Worse still, the development of larger sites and the continual changes necessary to keep them up to date are not usually carried out by one small, trained team, working in a single programming lab. More often, the work is carried out by different groups of people spread throughout the organisation, often totalling hundreds or even thousands. Members of these extended development teams are usually geographically dispersed and often work in different time zones, making communication a challenge.

It's not difficult to imagine that making changes to a website in such an environment is problematical, to say the least, and probably goes some way to explaining the large number of broken sites out there. Add in the requirement for legal and commercial approval, plus the bottleneck of the web master, and the problem gets that much worse.

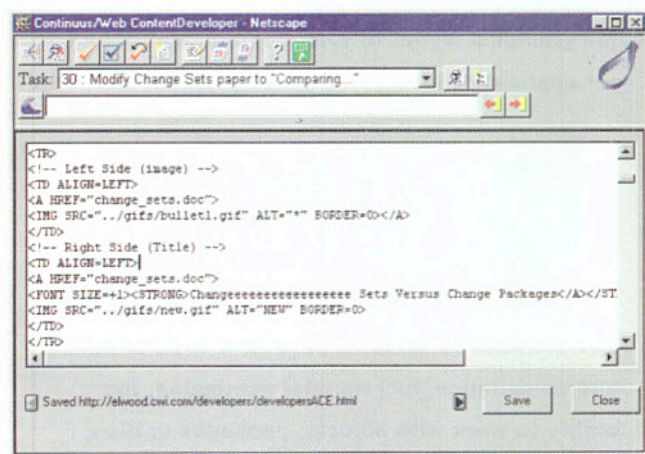


Figure 1 – Continuous/WebSynergy allows editing HTML across the network.



Change management

In the programming world, such a problem would be solved by one of the change/configuration management solutions available, but that sort of software is typically expensive, requires client-side installation, and isn't exactly entry-level in terms of the user skills required. Contributors to a website will have a wide range of skills and abilities – some will be designing HTML pages with tools such as Microsoft FrontPage, while others will merely be posting documents that have been created in other formats such as Microsoft Word and Excel. Professional developers will be using languages like Perl and Java, and tools such as Symantec's Visual Café.

Any form of manual change control system is burdensome. Especially so in an environment where already a lot of time is spent on manual tasks that are part of the development process rather than on creating web pages. Furthermore, website development needs to move at Internet speed, with continual pressure to ensure sites are updated promptly while retaining quality.

Although change management systems have been around for a while in the conventional software development arena, the market for tools to tackle the problem in the Web environment is much newer. So far, this is very much the province of the early adopter – there are relatively few products to choose from, and not many people are using them yet.

Continuous/WebSynergy

Most of the products aimed at this market tend to concentrate only on certain parts of the process, leaving plenty to do manually – or to be done by another product. Two products, however, encompass most if not all of the tasks involved: Platinum Raveller and Continuous/Web-



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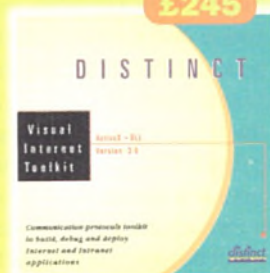
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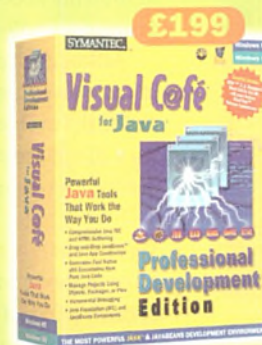
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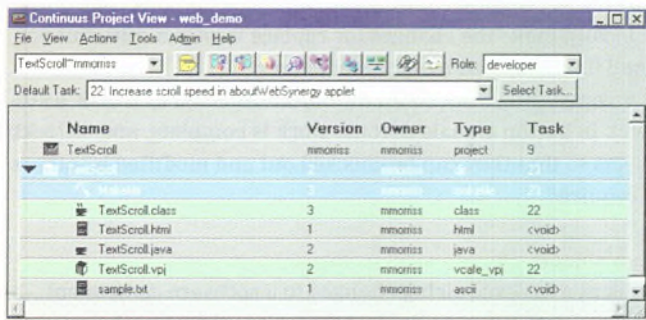


Figure 2 – Programmers work with the Continuous/CM client.

Synergy. The main difference between them is that WebSynergy, a new offering from Continuous, is a development of the Continuous change and configuration management systems for software developers.

It thus embraces change management for software components, as well as for the HTML pages themselves. In fact, for change control of programmed content such as Perl and CGI scripts, ActiveX controls, and Java and JavaScript applets, you use the integral Continuous/CM software development change management features.

No two development or deployment architectures for websites are alike. Development can take place on departmental servers, and there may be a variety of different configurations and staging servers between development and ultimate deployment. Production web servers, whether for the Internet or an intranet, may be in-house or hosted by an ISP, and connection may be via a firewall... WebSynergy is designed to have the flexibility to be able to accommodate a range of architectures.

It uses an internal database of users and roles and it allows you to set up as many users in the database as you like. The product is licensed on a per user basis. Security can be assigned down to the object level – to individual graphics files, for example – and can be on a role or group (team) basis. You can therefore protect one department's web pages from modification by another department.

Developers make the changes, the appropriate authority tests and approves them (often, the individual department), and web masters deploy the approved changes.

Tasks

WebSynergy uses a hierarchy of change requests, tasks, and objects. It is at its most effective if you map business problems to website change requests. For example, a car manufacturer may need to publish details of a new model on its website, or the HR department may need to update its intranet pages to reflect changes to pension arrangements. These would each correspond to a change request.

The project manager, who will usually also be the web master, will start by making a list of tasks that correspond to the business project, and will allocate them to the appropriate content developers. One task could be to change all the pictures on a page to reflect this year's design change, for instance. Tasks can be assigned to teams or individuals.

Usually, one change request will spawn many different tasks, and each individual task may correspond to many file changes, as in the previous example. However, there is no task hierarchy – you can't set up tasks that are children of other tasks.

Of course, such formal project design isn't always appropriate. With WebSynergy team members can create new tasks on the fly without them necessarily belonging to a specific change request. Later, such orphan tasks can be linked, if desired, to a change

request, and one task can be linked to more than one change request.

Using the Project View, reports can be generated to show task status – which ones have been assigned, completed, approved, and deployed. Many other report variants are possible, such as showing all tasks that have been assigned to one individual – to make sure that he or she isn't being overworked!

When a task is created, the project manager can specify the estimated time until completion and the priority. WebSynergy relies on priority rather than actual deadlines. If required, developers can be asked to log the actual time that it has taken to complete a task. From this information, it's possible to create customised reports for such things as departmental charge-back.

Tasks are tied to the concept of a release or version, just as in the conventional software development world. Hence, a task might be assigned to release number 17 of the website, and this in turn corresponds to the business problem being addressed – the launch of a new car, or whatever. But WebSynergy uses task-based deployment, so you don't need to wait for all tasks to be complete before deploying the new release.

The project manager/web master uses the Continuous/CM client software, the interface to the normal Continuous change management system. This requires client-side software installation, but the beauty of the interface used by content developers is that it is web-based and therefore ideally suited to large and diverse teams.

The structure of the project within WebSynergy – the list of tasks, their completion status, who they were assigned to, and the objects that have been changed – provides an automatic audit trail.

Content developers

Content developers interface with WebSynergy via the WebSynergy Content Client, the browser-based interface, but can still use their existing favourite software packages to carry out web page design. However, Continuous recognises that most people still write HTML using Microsoft Notepad, and provides a very cute solution – a Notepad-like editor that works across the network to edit pages on the server itself. Even though WebSynergy makes it easy to download and upload files from the web server, without having the pain of navigating to the files at each end of the connection, using this network editor makes life easier still.

When a content developer logs into the WebSynergy system, a second browser window opens automatically. One window displays the actual website being worked on, and the other is the control window – it shows a drop-down list of tasks waiting to be completed, in priority order. WebSynergy calls this concept surf and act, with the two windows being known as the Surf and Act windows respectively.

However, these two windows aren't two normal independent browser windows. They are linked by the concept of focus. At any time, the Act window is focused on the page being viewed in the Surf window – changing to a new page changes the focus of the Act window. Alternatively, you can explicitly type an URL into the Act window.

To suit a wide range of skills in your content developer community, the controls shown in the Act window are configurable. For example, the Create Task button wouldn't be appropriate for many developers.

Although the Act window will list task descriptions that indicate the page that needs to be worked on, they don't contain an embedded live URL. It's down to the developer to visit the page manually, using the Surf window. Once the developer has found the right page, the focus of the Act window changes to that URL, and it's then possible to view the properties for the page – these will show if the page is currently checked out by someone else, for example.





A standard template defines the workflow for a particular organisation, although this can be changed on the fly by the web master.

To make changes to the page, the developer checks it out by clicking the Check Out button in the Act window, and then edits it using the desired tool. Of course, changes could be far more complex than a simple edit and could involve changing or uploading other files such as images. After viewing changes to confirm that they're all right, the Check In button in the Act window is used to check the page back in. If you have to abandon the task for any reason, you can undo the check-out.

Content developers find this paradigm very easy to work with. Changes to web pages are quick to make, with the result that not only do you get the benefits of change management, but you also have a highly productive working environment that is much quicker and easier to work with than having to copy files around manually.

WebSynergy tracks each and every object (file) that the developer alters, thereby providing a full and detailed audit trail. If at any time you click on Task Properties, you get a summary of all the objects modified so far as part of the task.

Non-HTML documents

When a change is needed to a document that isn't an HTML page, but is in a special format such as Microsoft Word (or even an image file), the procedure is slightly different. Using the Link View button, the developer can view all links on the referencing page in the Act window. Alongside each link, it will show the actual filename and path. There's also a button next to each link that moves the focus of the Act window away from the referencing page to the object referenced by the link. This sounds as if it could be disorientating, but when you click it, the URL of the object appears in the Act window's URL box, so you can clearly see where the focus is and the name of the object you're currently working on.

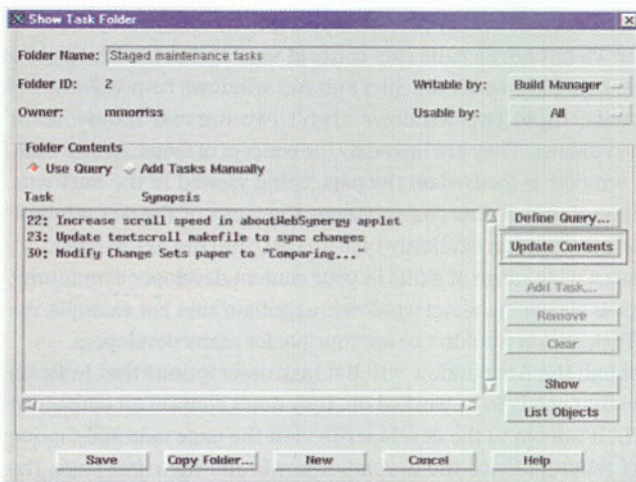


Figure 3 – Choosing the completed tasks to publish.

Using the Act window controls you can check the object out, download it locally, make the changes (or replace it with a different version), and finally upload it to the web server.

After completing work on all the objects affected by a task, a single Check In button signals that the work is complete, and unlocks the objects so that they can be checked out and modified by others if it is required.

Program objects

Let's look at a task requiring changes to a software component – a Java applet. First, you would select the task in the normal way, from the list in the Act window, and then surf to the applet itself – maybe it's a vertical text scroll box.

Using the Link View just described, you view the reference to the applet itself, which of course would normally be in a completely different place to the referencing page. Clicking on the magic button moves the focus of the Act window to the applet, and you check it out in the normal way, just as if it was an HTML page – in order to keep it under control of WebSynergy.

Next, you become a more traditional software developer and launch the regular Continuus/CM client software. From within the Continuus/CM client, you open the appropriate project that WebSynergy has created. You'll see that the default task mirrors the one in the list in the WebSynergy Act window.

Reconfiguring the project brings up the object that you just checked out using the WebSynergy Content Client. You now have to use the Continuus/CM client to check out the source file that needs changing. Once it's checked out, the source file can be worked on in any Java development environment.

After making, saving, and testing changes to the applet in the usual way, you need to upload the modified applet from your insulated work environment to the shared development web, or whatever web server it is you use as a staging server. This particular process can often be a fiddle, but it is considerably eased with the combination of Continuus/CM and WebSynergy.

First, reconciling will update the Continuus/CM repository with all modifications from the work area. Then, the usual upload operation driven by the Upload button in the Act window comes into play, although this time for the new Java class rather than for an HTML page. A quick reload in the browser window to test the applet, and you are ready to use the Check In button to complete the task.

Test and approval

A standard template defines the workflow for a particular organisation, although this can be changed on the fly by the web master as required for any particular project. This template can be configured to suit an organisation's architecture and requirements. For example, departmental approval may be required before corporate legal approval, and there may be an additional test stage to test the integrated website after departmental testing of a particular section. You can add and remove testing and approval stages as requirements change – indeed, the approval process can be changed dynamically to reflect the real-time requirements of the team.

Workflow is particularly suitable for helping ensure that company procedures and standards are enforced. If an organisation operates a quality system, then it is likely that any customer-facing information – which means the website in its entirety – will be subject to quality procedures. Continuus/CM is already used in ISO 9001/9002 environments, and WebSynergy can be used in a way to comply with such procedures.

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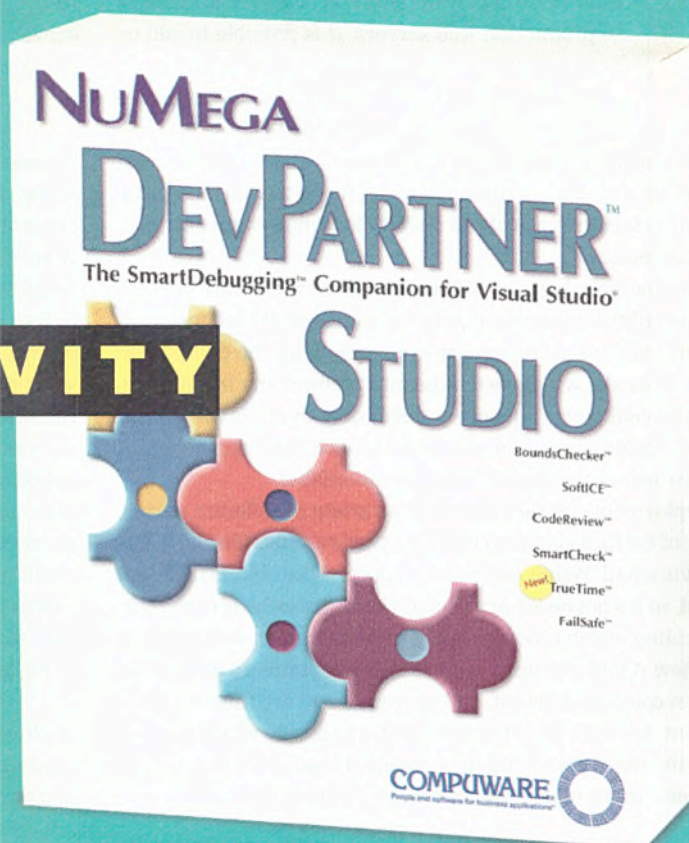
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Deployment

Web masters need the Project View of Continuous/CM to deploy the latest set of approved changes to production web servers. It is possible to add or remove individual tasks from a web server in a single operation, and easily and accurately recreate any previous version of the website.

When determining the tasks to deploy, the web master can run queries based on a variety of different task attributes, such as those executed by a certain group or those tasks belonging to a specific project (or change request).

The release methodology is task-based, so you can release parts of a project before all the component tasks are complete. Which tasks are released is entirely up to the web master reviewing the completed-task list, and he or she will have to take into account any interdependencies. In the real world, it's often necessary to deploy a partial release – for example, our fictional new car launch information might have to appear before the colour charts are available.

Actual deployment can take place via a variety of different means, from transfer of the files via ftp to creating a single archive file and transmitting that via email. WebSynergy only exports those objects that have been changed, so it's not necessary to copy the entire website each time.

When deciding which tasks to deploy, the web master works within the Project View. A folder of tasks is created that contains all those tasks that have been completed, tested, and approved, and are thus available for deployment. It's then up to the web master to decide which tasks to deploy, by individually removing the unwanted tasks from this list. To deploy the remaining tasks, the web master copies the list into the

Live Maintenance Tasks folder using a few simple operations. The live web is updated with the completed tasks, and should be tested as the final step. Even once tasks have been deployed to the production web server, they can still be pulled back simply by highlighting them and clicking on the appropriate button.

A double benefit

Professional developers, used to working with change management tools, could be forgiven for wondering how anyone ever managed to control website development without one. Using WebSynergy, you benefit twice. Not only is the website put back under control, but you actually end up with a very productive working environment. A proficient user – and it doesn't take long to become proficient – can complete a task involving checking out, editing, and then checking in a web page faster than the average modem connection could display the finished item.

It can't be said that WebSynergy is cheap. Prices start from around \$50,000, but that's for a comprehensive starter pack that includes 25 user licences, the first year's service and support, and professional services to help with implementation and training. But with people costing what they do, and the amount of time spent on the manual processes involved in website development, it wouldn't exactly take long to recoup that investment. The Continuous website can be found at www.continuous.com.

Andrew Ward is a freelance journalist and writer who specialises in business and technology subjects. He can be contacted at andrew.ward@award.co.uk.

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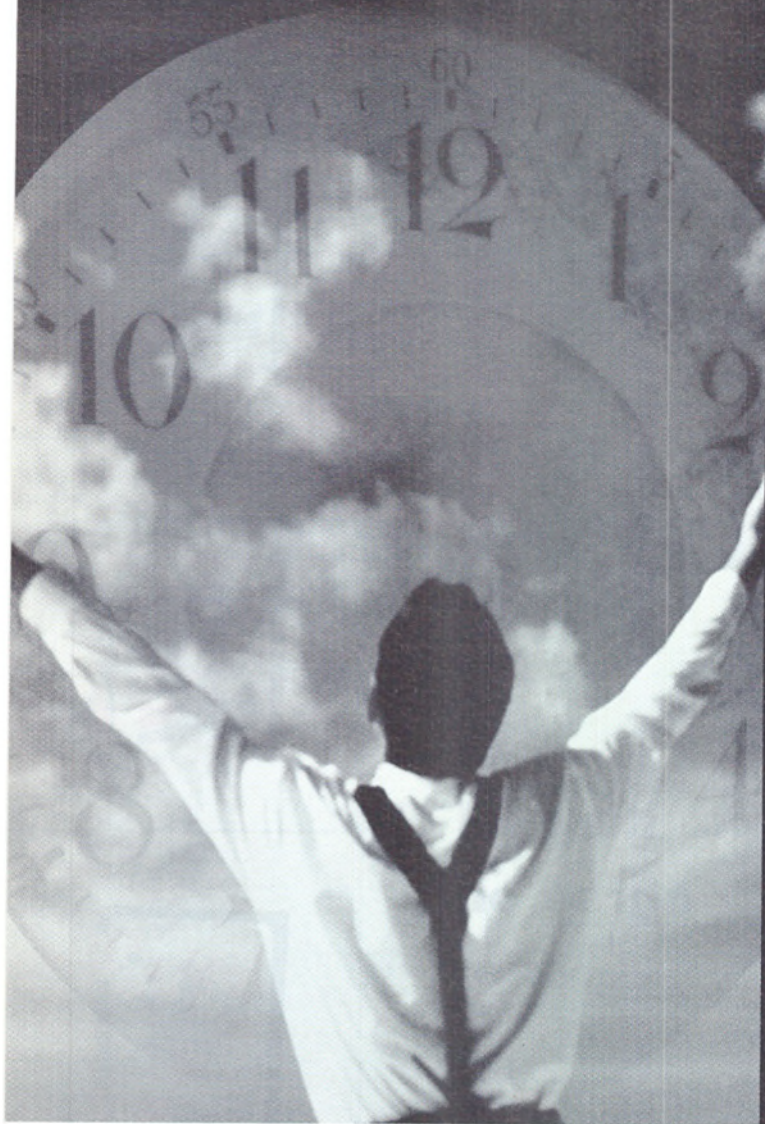
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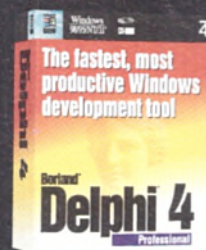
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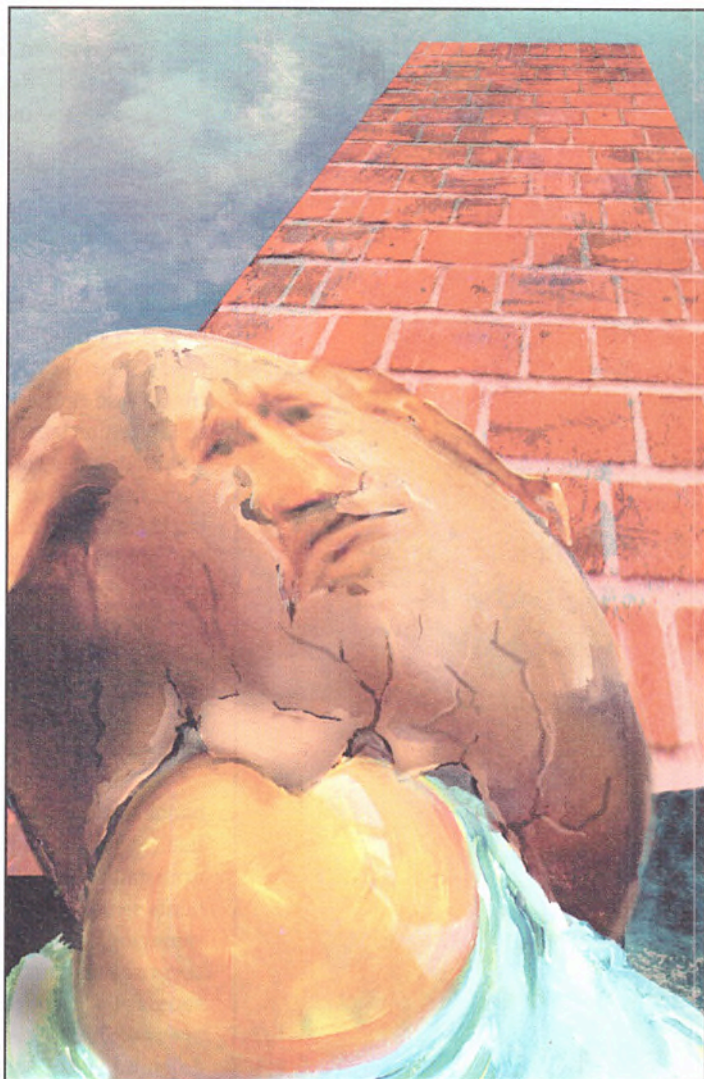
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Enquiry No. Nv24

EX9811

Putting old software back together again

Peter Collinson questions Microsoft's use of DLLs and the lack of consistency between the apparently replaceable code modules and their changing interfaces. And then there's the question of Registry storage and hives...



Daren Mason

I returned from my somewhat rainy holiday in Wales and turned my Windows NT machine on. NT reported that it couldn't find a crucial file, and kept saying it, refusing to boot. Ominous. Dead disk, I thought. Gloom set in.

Well, in theory, I'd planned for this. Nothing important was supposed to be kept on this machine. Windows NT backup will work only if you have a tape drive, and I don't. The word 'supposed' is crucial here, of course; I'd forgotten some things. For example, there were some Word for Windows template files hidden away on the system. Hiding files in some private folder is an appalling trait of Windows software. Ideally, I like to keep a strict separation between the standard system files and *my* files. It makes backups and system updates easier. However, on Windows, files are sprayed all over the system and you have no clue where they are – or how important they are. Well, I've now learnt my lesson and in future will make a more concerted effort to store files safely.

The quality of support

There is always support, isn't there? My NT machine was built and supplied by Gateway 2000. It has a good support policy, providing a free phone number to Ireland so that you can sit and wait for an engineer at its expense and not yours. The wait is usually not too long and the support that you get is good.

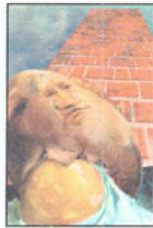
The company thinks about hardware support when it sends you the system, and provides its phone support engineers with diagnostic tools that the customer can run on its Universal Boot Diskette. For example, there's a low-level disk diagnosis program. When applied to my system, it showed that indeed the disk was deceased and had gone to spin in pastures new. Gateway would supply me with a new disk and an engineer to fit it. Better, the disk would be twice the size of the old one, which was a bonus.

The next day, an engineer from ICL appeared, disk in hand. Sorry, he couldn't install Windows NT 4.0. He could only replace what was on the machine in the first place. I said that I would install the system. Anyway, he used Gateway's Universal Boot Diskette to prove that the disk worked, formatting the new disk into three partitions. He then left. I had a raw machine and nothing but MS-DOS to look at...

Preserving the state of play

This kind of event gives you pause for thought. I began to wonder whether I really needed to go back to a newly formatted disk and reload things from scratch every time. Could I have used the extant system and preserved the state of play in some way?

One inherent problem is the way that the software is glued together. The notion of DLLs as implemented by Microsoft is central to its strategy but is imperfect. On the surface, I suppose it all seems



reasonable. Each component of the system is defined by an API and implemented by a replaceable code module.

The problem is that there is no control over the age of the code, so there is apparently no consistency check to say: 'this DLL is too old, and doesn't support the interface that I need'. Consistency checking is needed because Microsoft tends to 'improve' the API so that old programs fail to work because interfaces have been altered. There should be some way to maintain the old version of the DLL and install the new, preserving the ability of all programs to work. There are standard mechanisms that can be used to prevent the installation of an 'older' version of a DLL over a newer copy, and this is supposed to be used when the shared *SystemRoot* directory is updated. Its action depends on the installer software knowing about the mechanism and also using it.

These problems are made worse by some major software vendors (including Microsoft itself). On the whole, you should be able to uninstall some code and have all its components removed from the system. In practice, removing code from the system is imperfect because some manufacturers don't use the standard procedures. Data is often left lying around the Registry rather than being deleted. And if something has been made public by writing it into the *SystemRoot* directory, then this public file is rarely removed. Trying to reinstall something and start with a level playing field has unpredictable outcomes.

The Registry

It seems to me that it should be possible to recover a system on which something bad has been installed. This takes some planning, and involves more understanding of the Registry than is generally easily available. The Registry is central to the operation of Windows NT (and Windows 95 for that matter). It provides a central repository for all the configuration information for everything on the system.

Basic information about how it works is not made easily accessible – you have to spend time looking at the Resource Kit help files or get hold of a book on Windows NT. Even then, the information is sketchy.

When you install NT, you are asked to make a 'Repair disk'. I tried to use this once, a long time ago, and it was a disaster. I ended up reinstalling my system from

scratch. The Repair disk should be continually updated and refreshed as you make changes to the system. Trouble is, it's a little like applying a scrambler to the system because you can never remember what the system was running when you last refreshed the information.

And when you boot NT, you are given the opportunity to 'Press the space bar NOW to invoke Hardware Profile/Last Good Menu'. What's this about? What does it do?

Well, you need an understanding of the Registry before you can comprehend what these features are trying to achieve. The Registry stores sets of (key, value) pairs organised into a hierarchy somewhat like a filesystem. The 'value' of a key can be another key, so you end up with a tree structure that compartmentalises the name space in the usual familiar manner. Values are typed: they can be binary values with indefinite length, 32-bit binary values, and various flavours of string.

On NT, Microsoft supplies two programs for looking and editing the Registry: REGEDIT and REGEDT32. Neither is placed on any menus, so you need to start a command window or use the Run option to start them. REGEDIT displays the Registry in Windows Explorer style. REGEDT32 has fewer capabilities than REGEDIT on the whole, but has two things going for it. First, it has better search facilities, albeit that they are confined to searching strings. Second, it can dump the current contents of the Registry to a text file that you can use a regular editor to inspect.

REGEDT32 uses a multi-window interface. It deals with the full spectrum of value types supported by the Registry, allowing you to manipulate the access control values that protect Registry keys, and it can dump the database in binary. It also allows you to open the Registry in read-only mode, and this is a good idea if you are just looking. All changes you make happen instantly and you can easily wreak havoc on your system by some unintentional editing.

Opening up one of these programs will show you five root key names. There are two fundamental keys pointing to top-level hierarchies: HKEY_LOCAL_MACHINE and HKEY_USERS. The HKEY_LOCAL_MACHINE key contains information that is specific to the computer on which the system is running. Some of this information is created when the system boots and loads, supplying details of the hardware. Some is taken from files stored on the system, such as information about where software is loaded and its current default settings.

$$\begin{aligned} X+Y+ \\ [x/y] &= 4f/k \\ 75\%f+X+ \\ Y &= 24.0 \\ @ \end{aligned}$$

$$45/3000+14$$

Br Sulphate

$$45/3000+14$$

$$MC^2 - e = 4m$$

$$\begin{aligned} 75\%f+X+ \\ Y &= 24.0Co^2 \end{aligned}$$

$$Y = 24.0 Co^2$$

$$45/3000+14$$

$$= X \times \pi$$

$$X+Y+$$

$$[x/y] = 4f/k$$

$$45/3000$$

$$+14 = X \times \pi$$

$$= X \times \pi$$

$$X+Y+$$

$$Y = 24.0$$

The `HKEY_USERS` contains information about all the users on the system. The root key `HKEY_CURRENT_USER` is derived from the appropriate `HKEY_USERS` entry when the user logs in. Derived keys are aliases, not copies, so you can make changes in one place and it will be correctly updated elsewhere.

There are two other derived aliases: `HKEY_CLASSES_ROOT` contains the associations between file types and programs, the object linking and embedding information. It's an alias for the `Software\Classes` key in `HKEY_LOCAL_MACHINE`. Finally, there is `HKEY_CURRENT_CONFIG` supporting the notion of hardware profiles. When you establish an alternate hardware profile, differences from the settings in `HKEY_LOCAL_MACHINE` will appear in this tree.

When the system boots, its device types are loaded into the Registry and the drivers that use the devices are enabled by the Registry. You can see the current settings on your machine by using the Devices tool in the Control Panel. This shows all the device drivers that are available to your current system, whether they are *Disabled* (not being used), *Manual* (started by some program or user on demand), or *System* (being used in the current system and started at boot time). Drivers can also be *Started* and running, or not being used.

You can reboot into a new hardware configuration and specify which drivers will be used by that version of the system. I used this Hardware Profile technique when trying to install a dubious driver for my video card. I created a new hardware profile and loaded the new driver, which had a different name from the old driver and thus would show up as a separate entry in the Devices tool. Having loaded the new driver, I ensured that the old driver was enabled in the alternate hardware profile before I rebooted the system. I then had a way back to getting the system operational, if I needed it. I didn't as it happened, but the technique did work.

Registry storage

The static information in the Registry needs to survive a reboot and on NT it is stored in a set of files in `\SystemRoot\System32\config`. Each file here maps onto a key that appears in the top-level of the `HKEY_LOCAL_MACHINE` tree. User information is stored in `SystemRoot\Profiles\Username`, in a file called `NTuser.dat`. An engineer at Microsoft who failed his Apiary exams called these files *hives*.

Because Microsoft wished to preserve the contents of the hives, ensuring atomicity of

update, a transaction process technique is used to update them. Changes to a hive file are first written into a file called `hive.LOG`. When this is safely on disk, the hive is marked as dirty, and the changes in the LOG file are applied. Data is flushed to disk and the hive is marked as clean. If the system dies during these steps, then the loader can recover the correct data by replaying the logs.

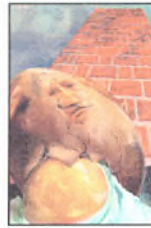
The System hive cannot be loaded in this way because it contains primary bootstrap information and the LOG replay code is not available when the bootstrap data is needed. This means that the System hive is replicated: each change to the hive is also made to an alternative hive. One of these files will be clean if the system crashes while update is taking place.

NT 4.0 introduced a new safety feature where the main hive files are written to `hive.SAV` just after the first stage of the bootstrap process. If setup fails in the second stage, it can be restarted from these saved files.

This shows that the people at Microsoft were worrying about the integrity of the Registry and trying hard to make it recoverable. To allow you to step back to a previous system version, a way of retaining a 'good' system load is provided. All the current configuration information is aliased to the `CurrentControlSet` key in `HKEY_LOCAL_MACHINE\SYSTEM`. The system retains the last set, and it's this information that can be loaded when the 'Press the space bar NOW...' question is asked. Thus you get the chance of one reboot to backtrack to where you were before you installed some software. Of course, this is useful only if the installation process has installed a new file and has not actually overwritten a component of the system with a supposedly new working version.

In practice, I find that one step back is not really enough. I need some tool where I can checkpoint the system and return to some known point before the disaster has struck. You can create a repair disk and retreat to that, but this will ask you to reload files from the original NT CD, and once you have installed a sizeable service pack then this option becomes less attractive.

One option is to backup your Registry files to tape along with your normal data backup sequence. There are also a couple of tools on the NT Resource Kits. The `REGBACK` command stores the current live Registry hives to a directory and the `REGREST` com-



*This strange solidity of
French soil under my feet.
Flinty cubes of gravel lodged
in the toes of my sandals.*

*A recurring disbelief
that this garden path
leads somewhere
else as concrete as here.*

*Another veranda.
Another house.
A wall for the suckers
of ivy to cling to.*

*In front of me the light:
this lovely unknowability
of air and the
changing alphabets.*

*Of cigarette smoke –
ring on ring; only sound*

*the motion
of birds' wings.*





mand resets the Registry from the saved files. You need to be in the Backup Group to be able to do this. There are a bunch of caveats with these programs; see their documentation. I must say that I haven't tried to restore any saved settings; it simply takes too long to resurrect my machine.

Booting the system into play

What of my own machine? How did I recover it from its raw state? Well, aeons ago I became a tithe-paying member of the Microsoft Developers Network (MSDN). This means that I have a load of recent CDs in the cupboard from Microsoft. Since Gateway replaced my broken CD drive with an updated model some months ago, I can even read them. Things looked hopeful. I dug out the *Windows NT 4.0 Workstation* CD and wondered what to do next. It was a long time since I had installed a version of NT 4.0, and then I had loaded it in addition to the previous version. The CD autostarts under Windows 95 or NT, but under MS-DOS you need to use the fundamental command set. Actually, there's not even a README file on the CD.

If you try and start to load the system with a clean disk, you quickly find that if you install an NTFS file system on your primary MS-DOS partition, the standard MS-DOS `FDISK` will not eliminate it. You can find no combination of actions for `FDISK` that permits you to delete the whole lot and start again. I ended up booting my BSD/OS boot disk and using the `disksetup` program to clear the disk down to nothing, and then booting MS-DOS running `FDISK` to establish the partitions again. NT can also glue contiguous NTFS formatted partitions into a single logical drive, so if in doubt, leave it out.

Well, from the CD, the `1386` directory was the place to go. There are several `EXE` files and I eventually guessed the correct one: `WINNT.EXE`. This is the primary installation program. It creates some basic setup floppies and then copies files to the hard drive. This is a very time consuming process.

While I was trying to get this basic load to go, I managed to start some file copying to the disk, and then kill it... I decided to go through the `FDISK/FORMAT` sequence again to ensure that the disk was clean. File copying took aeons, but once all the files were copied, the system booted slowly and then hung. I'd re-formatted the disk using the FAT32 file system. NT won't load onto this, it needs the older FAT16. I suspect that I spent around 3 hours finding this out.

Once you manage to copy all the files to the disk, you can boot the system. Just why *does* it copy all those files? Why can't it take some from the CD? I did manage to find the option to `WINNT` so that once I had the boot floppies I didn't get any more. Digging back into my MS-DOS memory made me give the command a `/?` option, and luckily the instructions had not scrolled off the screen. The `| MORE` command doesn't work on a CD, and wasn't available to me anyway.

Once you get there, installation proceeds reasonably simply. There are long gaps where the orange lights on the front of the machine flash, and then you have to answer some questions. Having to make intermittent interactions means that you cannot really concentrate on anything else while the system is loading. Such is life. Eventually, you get a working operating system.

I had to do this installation several times, for one reason or another. One reason was the inability of the latest 'certified by Microsoft' video driver (pulled from the net) to work with the vanilla system. My video card is one of the few for which Microsoft tells you to go to the manufacturer to obtain a driver. There seemed to be many other reasons why reloads were needed. I was determined to have a clean working system to use because NT, like other Microsoft systems, suffers badly

A couple of tips

First, when installing the system it's helpful to reduce the time that the system takes to boot. At one point in the loading process it is designed to sit and wait for you to choose the configuration that you want. The delay here is controlled by a number in the `boot.ini` file that's found on the root of your boot drive. The default setting is:

```
timeout=30
```

and can be reduced. Make sure this file is writable by removing read-only permission and then edit it using Notepad. I've set the value to 10 seconds on my system, which is plenty long enough to make your mind up.

Secondly, it's possible to automate the login process for your machine so that when the system starts a particular user is logged in automatically. This places that user's password in plain text in the Registry, so beware. There are several ways to set this up. On a raw machine, you need to edit the Registry, but the NT Resource Kit has a GUI version that will do it. For information on the Registry editing you'll need a copy of MSDN Library CDs; the appropriate article (Q97597) doesn't appear to be online.

from software rot. You happily install things that zap other programs by replacing some crucial DLL.

Well, I had a running machine. Next, I knew that I needed to install Service Pack 3 (SP3). Otherwise, the system has loads of security problems and since my machine is on the Internet, this is bad. SP3 is available on two of the other CDs from Microsoft. I installed this package and all seemed well. However, and I later realised that this was a mistake, I placed SP3 onto the system before I had configured the hardware: loaded the mouse driver; got the SoundBlaster card functioning, and installed the video drivers. The drivers for these are available from the appropriate place on the Internet, so getting recent working software was not too hard.

All go on the system front

Finally, after three days, the machine was up and running. I'd reinstalled the system perhaps eight times from scratch. I'd had a couple of late nights. Most of the software that I use was installed on the machine, and I managed to do some work. However, it still wasn't 'right'. There were problems with the networking. I initially blamed Samba, which provides me with WINS infrastructure. I spent a considerable number of days deep in Samba logs, armed with various network-snooping programs. Eventually, I raised a bug with the Samba folks, and learnt that the problems were very probably in my system. Four days later, I decided to start again with reinstallation. I was an expert now.

I did have all the drivers I needed, and I planned to install SP3 after I had set them all up. I could also monitor network performance and deduce at what point things stopped working properly. The problem turned out to be Microsoft's new user task scheduler, supplied with Internet Explorer. With this package, things ran slowly, without it they were fine. The system is up and running and seems okay. Why this program should impact on LAN network performance remains a mystery...

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Enquiry No. Nv26

Reaching understanding



There is a third element to C++ function prototypes. Francis Glassborow urges C++ developers to become familiar with exception specifications.

When you read this I will have returned from attending the next meetings of WG21 (C++ Standards Committee) and WG14 (C Standards Committee). They have decided that one of their meetings each year will be at the same place and overlapping in time. This should help damp down the tendency of some to flame the other group.

There is a considerable overlap of both interest and membership between the two committees. We hope that the extreme partisans will become more tolerant if they get social contact. Time will tell, and in a future column I will report on the amount of blood spilt.

Exception specifications

This autumn sees major releases of several C++ compilers. While few are yet in a state to be called standard conforming, many are aspiring to such a designation by their next main release.

One important consequence is that our code will be compiled by tools that are aware of exception specifications (ES).

For some time there has been a third element to the prototype (and signature) of a C++ function. We are all familiar with the return type specification. (And note that, as of about four years ago, this must be made explicit in C++. There is no implicit `int` in C++, nor will there be in the next release of C.) And we all know about the parameter type list that is required by a C++ function prototype.

However, there is a third element: the type of exceptions that may propagate from a function. Because of existing C++ code, WG21 chose to provide default behaviour. In the absence of explicit specification a function may propagate any exception. This decision is understandable, though unfortunate: it means that unless the programmer has the courtesy to add an exception specifier you have to prepare to catch anything.

How do you provide an exception specification? Very simply, you add `throw(<list of types>)` after the parenthesis that closes the parameter list in the prototype or definition of a function. The `<list of types>` lists all the types of exception that the compiler can expect to propagate from the function. Therefore: `void fn() throw();` means that `fn` is a function that takes no parameters, returns nothing, and is not expected to propagate an exception. However: `int gn(int) throw (std::exception);` declares a function `gn` that takes an `int` by value, returns an `int` by value, and may propagate any exception that is derived from `std::exception`.

If an exception, thrown during the execution of a program, tries to pass through a function whose ES does not include it, your program exits through `std::unexpected`. This is a function like `exit()` that cannot return. Its default behaviour is to call `std::terminate()`, but you can change this behaviour dynamically (at run time) as well as statically. If you need to know more about this process, including the use of `std::bad_exception`, then read a book such as *The C++ Programming Language, 3rd Edition*.

Some consequences

ES reminds me of the introduction of `const` to C. Without it you had to assume that any time you passed a pointer the object pointed to

might change. There wasn't any way that you could pass an array for read access only (well you could wrap it in a `struct` and pass the resulting `struct` by value but I doubt you would want to do that very often). When `const` first became available many programmers found that it had an apparently evil influence on their code. Once they started using it, they had to insert it in many other places.

Like the use of `const`, it is largely a matter of learning how to write code that benefits. I think we still have a long way to go before most programmers instinctively make positive use of exception specifications.

Many programmers object that placing an ES on a virtual function requires that all overriding versions in derived classes shall have at least as restrictive a requirement. This indicates a need for a more suitable coding technique. The first step is to create your own exception hierarchies for your classes. Typically, embed your class in a namespace and define your base exception in the same namespace. You can get a similar effect with a nested class but a namespace allows users to import your exception names without always having to qualify them. Your code might look something like this:

```
namespace MyTypeSpace{
    class MyTypeException {
    public:
        virtual ~MyTypeException(){}
    };
    // the destructor makes the class polymorphic so that you
    // can catch derived exception types with a base instance
    // and use RTTI to identify it if you wish.
    class MyType{    // most details omitted as irrelevant
    public:
        virtual ~MyType() throw();
        MyType() throw(std::exception, MyTypeException);
        virtual void printon(ostream & = cout)
            throw(std::exception) const;
    };
    ostream & operator<<(ostream & out, MyType const & mt)
        throw(std::exception) {
        mt.printon(out);
        return out;
    }
}
```

The destructor promises not to propagate exceptions. This imposes an identical requirement on any destructors for derived classes. Imposing this requirement is essential for exception-safe use of the STL. If the destructor for your class can propagate an exception it will create chaos if you ever place it in an STL container. Even if you never do this, destructors that propagate exceptions are landmines waiting to blow a hole in your carefully honed application. Destructors are called in the process of stack-unwinding while handling an exception. While you are allowed to throw an exception during this process it must be caught before any attempt is made to continue handling the original exception. If it isn't, your program will exit through `std::terminate()`. In other words



As a general rule virtual member functions should be specified to throw `std::exception` and the base exception type for the class hierarchy.

destructors that propagate exceptions threaten to nullify the purpose of exceptions: controlled handling of problems.

Optimisation

Get in the habit of adding `throw()` to your destructors. With modern compilers you will probably get faster execution and smaller code by informing the compiler of places where you promise it will not have to handle exceptions. Some older compilers are less generous. As compilers and other tools become more sophisticated, providing exception specifications will also allow some static verification. This applies to all exception specifications. For example, suppose that I added to the exception specification for `MyType::printon()`, but failed to add to the ES for `operator<<(ostream &, MyType const &)`. The compiler will be able to warn me that I run the risk of `unexpected()` because it will see the call to `MyType::printon()`. Analysis tools might then be able to add a query about why my ES for `printon()` added an apparently superfluous type.

In this case, my original ES for `printon()` is probably overly constraining because it forces all overriding implementations in derived classes to restrict themselves to exceptions derived from `std::exception`. As a general rule virtual member functions should be specified to throw `std::exception` and the base exception type for the class hierarchy.

Furthermore, as a general policy, exceptions thrown as the result of calling member functions of one of your data members should be handled within your own class implementation. Where you cannot handle these completely, you should handle what you can before throwing your own exception type. This way we avoid ever growing lists of exception types.

The biggest problem is dealing with calls to functions that do not provide any ES. Hopefully, this will become less common as time goes by, but until then you need to code defensively and avoid propagating the problem to users of your code. Something like:

```
namespace MySpace {
    class UnknownException {};
    void example() throw(exception, UnknownException) {
        try {
            // normal code including one or more
            // functions without explicit ES
        }
        catch (exception & e) { throw; }
        catch ( ) { throw UnknownException(); };
    }
}
```

The first catch catches all exceptions based on `std::exception` and immediately re-throws them (in real code you might want to do some processing) in their true form. Be careful not to write

`throw e` because that will throw only the base `std::exception` and therefore strip off all the extra information carried by the derived type.

The second catch traps all other exceptions and does the only thing it can: tell the outside code that an unidentified exception arrived here. Not very helpful, but it limits the damage. You might want to refine `UnknownException` so that it provides some debugging data such as filename and line number. You might also like to provide a single `UnknownException` type for all your code by encapsulating it in your most general personal namespace. Whatever you do, don't stick it in global space where it will conflict with every other thoughtless programmer's provision.

I have run out of space again. But please learn about exception specifications, and use them.

The prize-winning problem

In July's column I packed two errors into the single if statement: `if (ct == ColouredText{ "example", red}) /* do something */`. C++ has clearly cast its evil influence on programmers because hardly anyone spotted the missing `struct` qualification to `ColouredText` (even though it was out there in the declaration of `ct`).

Even fewer recognised that the comparison operators in C only apply to built-in types and to pointers (and before you ask, C9X does not intend to change that). Many claimed that `ct` was uninitialised, but there was all that unspecified source code, so such a claim is in fact speculative.

Out of almost two dozen responses I selected David Leftley for the prize. He was one of only three that spotted the missing use of `struct`. He also recognised that there was a problem with the use of `'=='` even though he failed to pin down the detail.

Last month's problem

The answer I was going to propose to last month's column is actually based on checking against existing compilers rather than a correct reading of the C++ Standard. The real issue is more complicated and is serious enough to need fixing within the Standard itself. The published example does not exhibit any undefined behaviour but other not too dissimilar examples currently exhibit serious undefined behaviour (such as uninitialised pointers). I will be covering the whole topic in greater detail in my next column.

This month's problem

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

```
#include <stdio.h>
#define length(array) (sizeof(array)/sizeof(array[0]))

int main(void) {
    char * buffer = "This is some space for input data...";
    fgets(buffer, length(buffer), stdin);
    /* more code */
    puts("Have a nice day!");
}
```

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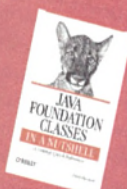
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A piece of the action

Mark Smith looks at TAction, Delphi's new way of dealing with user interface events, which helps both to separate

out application logic and to provide UI consistency.



Delphi 4 offers a new way of dealing with user interface events such as clicking buttons or choosing items from a menu. Instead of writing code in the `OnClick` event of user interface components, you link them to objects of the `TAction` class. This month, I want to show how to use `TAction` to add user-customisable toolbars to your applications. Before getting into the main part of the column however, I want to explain why `TAction` and its associated container, `TActionList` are a good thing.

`TAction` helps solve two problems in Delphi development. The first problem is an architectural issue: application logic coupled to the user interface. Adding event handling code to a single button or menu is a trivial task in Delphi; you merely double-click on the button or menu item and start writing code. Unfortunately, doing this links your user interface and the application logic very tightly. In the middle of a RAD session most people don't bother to write the business code in another module, which limits reusability. The `TAction` objects are stored in a `TActionList`, which can be placed in a `DataModule`, therefore using these components moves code out of the user-interface forms and into the business-objects layer. Since `TActionList` groups Actions together into categories, it makes it easier to manage a group of related items. For example, you could have an `ActionList` that contained the standard Cut, Copy, and Paste actions.

The second problem that `TAction` alleviates is in managing the choices available to the user. Prior to Delphi 4, making sure that menu options and toolbar buttons were available only when appropriate required more effort than seemed necessary for a RAD tool. The `TAction` objects manage the state of the controls linked to them, so if you set the Action's `Enabled` property to `False`, all controls linked to it become disabled. `TAction` goes further than this, taking over control of the caption, glyphs, and hotkeys of associated controls. This makes it very easy to keep all your user interface elements consistent.

Using TAction

The usual way to add `TAction` objects to an application is to add an `ActionList` object to a form or `DataModule` and add Action objects using the component editor. Double-clicking a `TActionList` brings up the `ActionList` component editor. You create your own custom Actions by pressing the Insert key. This creates new Actions specific to your application and adds them to the `ActionList`. The `ActionList` editor has a few standard items for window management, database navigation, and clipboard operations. The code for these is in the modules `StdActns` and `DBActns` in the VCL source directory.

You link a user-interface control to a `TAction` object by setting the new Action property using the Object Inspector. `TAction` is defined as a public property of `TControl`, so it is widely available throughout the VCL. Many descendants of `TControl` publish this property, making it visible in the Object Inspector. When you set the Action, the normal behaviour of the control (eg the `OnClick` event handler) is replaced with a call to the `Execute` event handler of the `TAction` object. That way, when the user clicks the button or chooses the menu

option, the Action's `Execute` method is called. The list of components that expose an Action property seems a little arbitrary, being the buttons, menu items, `TRadioButton`s, `TCheckBox`, and `TStatusBar`. I suspect that over time, more classes will be made Action-aware.

The processing pathway when you trigger an Action is rather baroque. You can either process the event in the `ActionList.OnExecute` method, or let the global `Application.OnActionExecute` method deal with it. If neither of these events have code attached to them, or if your code does not set `Handled` to `True`, the Action's own `OnExecute` gets to execute, which is what you want most of the time. To enable or disable the `TAction` object, add an event handler for the `TAction.Update` event and set the `Enabled` property to `True` or `False` to reflect the availability of the Action. Be aware that the Update handler can be called a lot during `Application.OnIdle` processing – keep your code to a minimum here.

Adding to the Delphi IDE

You can add new `TAction` components of your own in a new module, and install them into the Delphi IDE as part of a package, which provides a convenient way of reusing common code. Like other components, `TAction` descendants need to be registered in the Delphi IDE, but you use the `RegisterActions` procedure rather than `Register`. The parameters of this procedure are not well documented in the help, and are incorrect in the Developer's Guide. The `CategoryName` parameter is the name of the category to which this Action is to belong, `AClasses` is an array of `TAction` classes, and the final parameter, `Resource`, does not appear to have any effect. I suspect that it was intended to be used by the Delphi IDE to determine the type of object to pass in the parameters to the `TAction's Execute` event. Setting this parameter to `nil` seems to be the safest option.

Customising

Having introduced Actions and how they are used, I want to show a few techniques for adding customisation to toolbars. The goal is to be able to present the user with a list of all of the tasks that an application allows, and let the user drag from this listing onto the application's toolbars. Obviously, these customisations have to be stored and used next time the application is run. While there is nothing inherently complex about this, it required a surprising amount of code. Figure 1 shows the relationships between the classes. VCL classes are dark blue, while new classes are light coloured.

This month's demonstration application is based on the Delphi `RichEdit` application. This has one main form with a toolbar on it and a dialog box of type `TToolDialog` that provides the focus for customising the toolbar. You can drag Action items from the dialog box onto the toolbars belonging to the main window. The dialog box gets the list of Actions from a central object called `ActionServices`, which every `ActionList` in the application registers itself with. The object `ActionServices` has a method `AddActionList`, which takes



The final piece of the puzzle is to get the toolbars to save their state in between sessions. This is fairly easy to do.

an `ActionList` and copies references to all of the `TAction` objects that the `ActionList` contains. Internally, `ActionServices` uses a helper class called `TActionReferenceList` to manage the list of Actions. The VCL class `TActionList` is inappropriate here because it takes on the lifetime management of the Actions it holds – destroy the `ActionList` and the Actions get destroyed. The `TActionReferenceList` just copies the object references and does no lifetime management. `ActionServices` also has an `ImageList` property to manage the images for the Actions.

The `TToolDialog` class uses `ActionServices` and presents the Actions sorted according to category, allowing the user to select an Action from the list and drag it to one of the toolbars. The dragging process takes advantage of a descendent of `TDragObject` called `TActionDragObject` to simplify the operation. This new class has an additional property of type `TAction` and is responsible for carrying the Action to the toolbar that the user wants it to appear on. Since we allow the user to drag and drop buttons between toolbars, `TActionDragObject` has a `Source` property. This is set when dragging from a toolbar, and is used to remove the button linked to the Action from the old toolbar.

The toolbars themselves are a new class: `TDragToolBar` is derived from `TToolBar`. This class has to exhibit two distinct kinds of behaviour. Normally it acts like a regular toolbar, but some of the time normal behaviour is suspended to allow the user to add new buttons and rearrange or remove existing ones. My own preference is to try and minimise state-dependent behaviour by moving it into other classes, and that is what I have done here. The state-dependent behaviour is delegated to an object of class `TDragToolBarStrategy`, which the toolbar calls to do the actual work. Changing the behaviour of the

toolbar is as easy as deriving a new `TDragToolBarStrategy` descendent and passing it to the toolbar. The most important descendent of `TDragToolBarStrategy` is `TDragToolBarCustomizeStrategy`, which encapsulates the customisation behaviour. This class makes all the buttons draggable, accepts `TActionDragObject` instances, and has a menu to allow the user to insert spacing elements into the toolbar. While the toolbar is using the customise strategy, the buttons are unlinked from their Actions. This is to temporarily decouple buttons from their normal Action, and allows the buttons to be draggable. The tag is used as a pointer to the Action, and is restored when the customise strategy is removed.

The only fly in the ointment is the handling of images. Each `ActionList` is usually associated with a `TImageList` component that holds the graphics that represent the Actions. Each toolbar is also associated with a `TImageList` component (ignoring the `HotImages` and `DisabledImage` for now) that may be a completely different set of images. Clearly, an Action could derive its image from one `ActionList` and then be placed on a toolbar linked to another `ImageList` entirely, which would not give the desired result. The simplest way to resolve this is to have a shared image list and add all the images to it. This shared image list is a property of `ActionServices`, and all `TDragToolBars` should reference this rather than any other `ImageList`.

Persistence

The final piece of the puzzle is to get the toolbars to save their state in between sessions. This is fairly easy to do, and is implemented by the `Save` and `Restore` methods of `TDragToolBar`. These two methods take a `TRegistry` component to read and write the toolbar settings. The host application is responsible for setting the registry key to the correct point for the toolbar to read or write from. Most of the time, this will be a location such as `Software\MyCompany\MyApp\Version3\ToolBars`. If you have a toolbar called `ToolBar1`, then the `Save` method will add keys for each of the buttons and dividers on the toolbar in a new section called `ToolBar1`.

The `Save` method stores the names of the `TAction` objects associated with each button. The `Load` method has to use these names to assign Actions to buttons when the application is reloaded. To make this work, the Actions need to exist and to have been registered with the `ActionServices` object prior to the toolbars loading themselves from the registry. If an Action cannot be found, it is ignored and the toolbar carries on loading all the other buttons.

The demonstration

As mentioned, this month's demonstration application is based on the `RichEdit` demo app in the `Demos` subdirectory, but the `ToolBar` has been replaced by a `DragToolBar` and I have added calls to load the toolbar buttons when the application is opened and to register the `ActionLists` with the `ActionServices` object. I have also added an Action to display the customisation dialog, off the `Edit` menu. I leave the localisation into German, French, and Swedish to you.

There is little else to do on the application. If you program your application to use Actions, then you can take advantage of the customisable toolbar classes here. You do not need to limit yourself to customisable toolbars, since Actions offer so much flexibility. ■

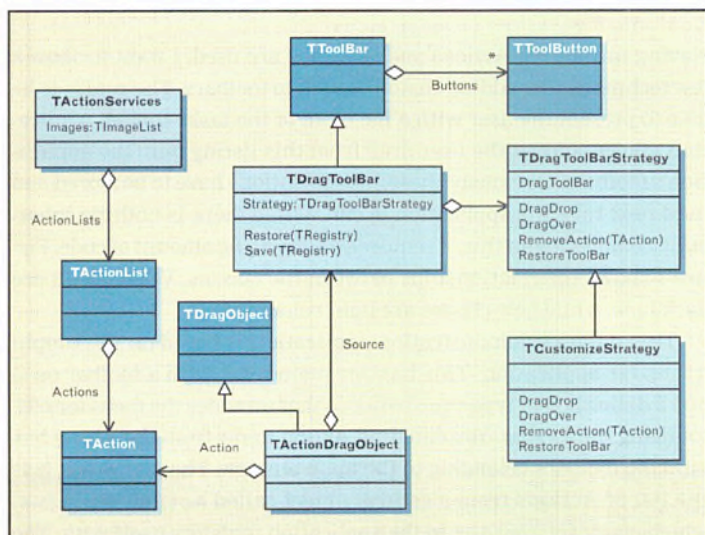



Figure 1 – Toolbars class diagram.

EXE ONLINE Mark Smith is a contractor specialising in Delphi. You can contact him at msmitha@cix.co.uk or say hello at a Borland Users Group meeting. Call 01980 630032 for details. The code for this article is available on EXE OnLine and via ftp at ftp://ftp.exe.co.uk/pub/exestuff/9811_delphi.



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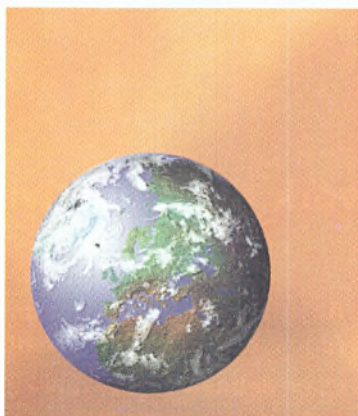
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Tales from the script



Tom Guinther gets to grips with the TCL scripting language and shows how TclBlend and Jacl make it easy to integrate

and interface Tcl into your Java application.

I have a new obsession: the scripting language that goes by the name of Tcl/Tk. You know you're obsessed when in a three-day period you read 500 pages of documentation, peruse 50,000 lines of interpreter and byte-compiler code, and write 5,000 lines of script. Then, when you are all done assimilating, you kick back and go, 'cool'.

About Tcl/Tk

Tcl is an abbreviation for Tool Command Language. It's a scripting language that was designed and created by John Ousterhout. Tk is an abbreviation for Toolkit and is a set of Tcl extensions for developing GUI applications. Even though Tk is also very relevant to this area, I'm going to focus on Tcl and its applications with Java.

Tcl is a simple scripting language designed to be easily adaptable and highly extensible. Typically, the Tcl interpreter is embedded within an application that extends the Tcl command set in an application-centric way. The application generally provides a mechanism for the user to execute scripts within the application environment. The user's scripts would have access to functions, variables, and language extensions that are implemented by the application but which are seamlessly integrated into the Tcl scripting environment.

If you are wondering why Tcl and not some other scripting language, like VBA, Perl, or JavaScript, part of the answer lies in the original concepts and purpose driving Tcl. First, Tcl was originally designed to be embedded in C applications, which means application integration is by design. Second, from a language point of view, Tcl is relatively small and concise, which makes it easy for anyone to learn quickly. Not to be underrated is that Tcl is easily extensible via your application or procedures defined in external Tcl scripts, and it makes great glue code for tying all those 'components' and beans together. Last, but not least, when it comes to integrating and interfacing Tcl into your Java application, two Tcl technologies, TclBlend and Jacl, make it very easy and straightforward.

TclBlend and Jacl

TclBlend is a bridge between the original C-based Tcl interpreter and the Java environment. You can use TclBlend and its `java` package to connect Tcl to your application and the Java VM. Users can write scripts that create and manipulate Java objects almost as if they were writing Java code. The following Tcl script creates a new object of type `ExampleObject` and changes its `Title` property:

```
# using the TclBlend java package to create an instance
# of class ExampleObject in the Java VM
set exampleObj [java::new ExampleObject
"This is a title"]
# change the object's title field by calling
# setTitle method
[$exampleObj setTitle "This is a new title"]
```

If you don't follow the code immediately, don't worry. It should make more sense by the time you've finished reading this column. TclBlend is yet another example of what can be done with the Java Reflection API. The `java` package uses the Reflection API to create objects and find methods and properties so that they can be manipulated from Tcl code.

Jacl (Java Application Command Language) is a 100% Java implementation of the Tcl interpreter and the `java` package. For anyone who wants to get true cross-platform and write-once-run-anywhere technology, Jacl is it. Not only does this include your application and its scripting language (Tcl, right?), any extensions you write (in Java or Tcl) are cross-platform. Beyond the obvious this is a big win because up to this point extensions for Tcl were typically written in C/C++, which meant that many things did not easily port at either the binary or source levels.

If you are wondering why you need TclBlend when you have Jacl, then I have to commend you for being very observant. They essentially do the same thing and provide the same functionality. One is C-based (TclBlend) while the other is 100% Java. If you think Jacl is the obvious choice then you are not wrong but you are not necessarily right either. TclBlend is legacy technology but if you already have a large investment in C/C++ code, then TclBlend could be the perfect tool to help you begin the migration to pure Java. Secondly, TclBlend works with proven technology and because Tcl has been ported to most platforms you are getting a reliable cross-platform solution. On the other hand, Jacl has been a major development effort and although version 1.0 has been officially released it is first generation Java technology. Jacl may not be as robust or as feature-complete as TclBlend. I don't think that is a big deal, but you may want to evaluate both options.

The Tcl language

In case you are not Tcl literate, what follows is a quick overview of the Tcl scripting language. Tcl, like many scripting languages, does not have explicit types. Instead, all types are represented by strings. Tcl will provide numeric conversion as necessary if the context calls for it. For example:

```
set avar 42
set answer "The answer is "
append answer $avar
puts answer
produces: The answer is 42. However:
set avar 42
puts "The answer is " [expr $avar *3]
produces: The answer is 126.
```

In both examples the variable `avar` is initialised to the value 42. In the first example the value of `avar` is appended to the variable, `answer`. The context implies a string operation. In the second exam-



Your first instincts as a 'procedural' programmer will be to apply grammar rules to the language, which will lead to 'small' mistakes.

ple the same basic effect is achieved but the multiplication operation implies that `avar` should be treated numerically.

Unlike most languages Tcl does not have a fixed grammar that defines the language. Instead the Tcl interpreter parses individual 'words', which are commands or their parameters. Words are separated by white space (spaces and tabs) but certain characters such as double quotes change this behavior. The interpreter follows the rules for parsing Tcl script, performs various types of substitutions (more on this later), and executes commands without any knowledge of what they mean. The normal language constructs you might be familiar with such as flow control (`if`, `for`, `or`, `while`) are implemented as commands and are not part of the language. As a matter of fact, these commands can even be redefined to mean something else! If you've ever used the Forth language then bells are probably going off in your head. Seems to me like there are quite a few superficial similarities in the parser and command design philosophies.

Take the following code for example:

```
if {$avar>0} {set $avar [expr -$avar]}
```

The Tcl parser looks at this as if it is three words, the first of which is the command to be evaluated. The other two words (grouped by `{}`) are the command parameters. The first parameter to the `if` command is an expression to be evaluated. The second parameter is the body of the `if` command and will be executed (by invoking the interpreter recursively) if the expression `{$avar>0}` evaluates to true.

Your first instincts as a 'procedural' programmer will be to apply grammar rules to the language, which will lead to 'small' mistakes. Just remember that the specific commands don't change the context or how the interpreter works.

Except no substitute

The most important aspect of Tcl is substitution. We've already seen some examples of substitution and if you have been scratching your head, it is now time for a little enlightenment (although I can't make any promises).

The first type of substitution is *variable* substitution. This is where the interpreter replaces the `$` and the variable name that follows with the variable value.

```
set avar 42
```

```
set bvar [expr $avar*3]
```

In the second line, the occurrence of `$avar` is replaced with 42, in effect changing the command to: `set bvar [expr 42*3]`.

The example also contains an example of *command* substitution, which is invoked by the square brackets (`[]`). When the interpreter sees an opening bracket everything inside the brackets is interpreted as a new Tcl script. In this example, the script `expr 42*3` will be evaluated and the result substituted back into the orig-

inal script, ultimately leaving us with a fully substituted script:

```
set bvar 126.
```

The third type of substitution is *backslash* substitution, which you should be very familiar with. Backslash substitution allows you to represent special characters as themselves, for example:

```
set amount 3.29
```

```
prints "The current amount is \$$amount"
```

produces: The current amount is \$3.29.

Backslash substitution is a form of 'quoting' that means that the parser changes how it operates when it is in a quoting mode. Tcl also provides two other forms of quoting, double quotes (`"`), and braces (`{}`). Double quotes prevent tabs, spaces, and semi-colons from being command separators. Everything between the double quotes constitutes one word. All forms of substitution occur inside double quotes (but not braces). For example:

```
set avar "This is a parsed as one \"word\""
```

would produce: This is parsed as one "word".

And: `set avar 3`

```
set bvar "The result is [expr $avar*14]"
```

would produce: The result is 42.

Braces perform the same function as double quotes except that substitutions are disabled. This is an extremely important point to remember as the following example shows:

```
set avar 3
```

```
while {$avar>0} {set avar $avar-1}
```

Like the `if` example above, the `while` command is executed with two parameters: the expression to evaluate `{$avar>0}` and the body (script) to be executed while the expression is true. You should have a better understanding of how Tcl parses three words out of this script. The braces around the expression and the body prevent the intervening white space from terminating the word. Only the closing brace can terminate the word. What may not be obvious at all is that using the braces is essential because we don't want the interpreter to perform substitution before the parameters are passed to the `while` command. We want the substitution to occur during the evaluation of the command. If we use quotes and substitution occurs prior to the `while`, the outcome will be fixed and quite likely lead to an infinite loop.

Imagine the following:

```
set avar 3
```

```
while "$avar>0" "set avar $avar-1"
```

with variable substitution performed immediately, the `while` command receives the following two arguments: `{3>0}` and `{set avar 2}`. That is not going to work out too well.

Tcl/Tk, TclBlend, and Jacl

Although I have given you a lot of preliminary information on Tcl and its syntax, you may want to do a little of your own research and experimenting to become more familiar with the concepts. That way you'll be prepared for the *Day of the Jacl*, next month's column, when we'll be getting serious about integrating Tcl and Java.

You can obtain free downloads of the Tcl 8.03 binaries and source at the Scriptics website www.scriptics.com. TclBlend and Jacl are available at the same site using www.scriptics.com/java. The book I read on Tcl, *Tcl and the Tk Toolkit*, was written by the creator of the Tcl language, John Ousterhout, and is published by Addison Wesley (ISBN 020163337X).

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ADVANCED WIN32 MULTITHREADING

Multithreading Concepts, Kernel Objects, Processes, Threads, Synchronisation, Asynchronous I/O, Debugging, DLLs, Server Design

Clipcode Training is pleased to announce this new two-day hands-on intensive training course aimed at senior software engineers. It is available in English or German on-site throughout Europe, for a minimum of 6 attendees. To arrange an on-site presentation send your full contact details, proposed date & location of course and the number of attendees to Clipcode's Eamon O'Tuathail (via email: eamon.otuathail@clipcode.com or fax: +353-1-2350423).

This training course examines how to use the Win32 API to build sophisticated multithreaded architectures. When designed correctly, multithreading can substantially increase application performance and responsiveness to distributed clients and end-users.

The Win32 kernel object is the opaque foundation for multithreading - based on this are the process, thread and various synchronisation objects - mutex, event, semaphore, waitable timer and job - each of which targets different needs. Thread activity, lifetimes and inter-thread communication must be co-ordinated. Threads impact how to develop DLLs, memory storage, and debugging utilities.

Various higher-level design patterns may be used to route workitems in multithreaded servers. Custom tools may be developed to determine which thread is blocked waiting on which resource, and the state/owner of each resource.

The optimal server architecture is one active thread per processor with minimum context switching. To service high volumes of clients (e.g. a web server) many requests may be multiplexed over a few threads using I/O completion ports.

This course supplies attendees with a clear understanding of the concepts underlying multithreading, together with practical experience of multithreaded server development.

Target Audience:

System architects and experienced developers who need to gain an in-depth understanding of Win32 multithreading.

Prerequisites:

Attendees must have good experience of systems-level programming, on either Win32 or UNIX. Knowledge of the ANSI C language is necessary; knowledge of ISO C++ is desirable.

Follow-on Courses:

This multithreading course may be run in conjunction with our courses on *Win32 Systems Programming* and *COM/Automation/ActiveX*

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Multithreading Concepts

- Thread definition
- Advantages and disadvantages
- Scheduling vs. synchronisation
- Parallelism and concurrency
- Compute-bound and I/O bound apps
- Race conditions, deadlock, starvation, priority inversion, re-entrancy

Kernel Objects

Win32 kernel objects and handles
Usage counting
Sharing handles among processes

Processes

- Create/OpenProcess APIs
- Retrieving the exit code of a process
- The environment and command line
- Managing child processes

Threads

- CreateThread API & threadprocs
- The C runtime library
- Thread priority and processor affinity
- Thread lifetime and state management
- Fibers

Synchronisation

- Reasons for synchronisation
- Critical Sections and spincounting
- WaitForSingle/MultipleObjects
- Mutexes, Events, Semaphores, Timers (in same / different processes)
- The "Protect data, not code" Principle

Memory and Threads

Thread Local Storage
Heap Storage, Stack Storage

Asynchronous I/O

- Overlapped, APC & Scatter/Gather
- I/O Completion Ports

DLLs and Threads

- How threads interact with DLLs
- Serialised DllMain, shared sections
- Robust DLL design for threads

Debugging with Threads

- Querying information about running processes/threads and their attributes
- The serialised OutputDebugString API

Resource Management

Creating a custom Resource Browser, to display which thread is waiting on which synchronisation resource

Threads with C++

Threads and STL/Exceptions/Class libraries
Accessing resources using Smart Pointers

Design Issues

Single Writer/Multiple Readers, Monitor, Once-Off Initialisation, Dining Philosophers
Calling legacy code from multiple threads
Converting legacy code to multithreading
Threading enhancements in Windows NT 5

Multithreaded Architectures

Pipeline Model, Producer-Consumer Model
Work-Crew Model, Master-Slave Model
Creating threads on demand vs. elastic pool

Advanced Multithreaded Project

Development of a complete multithreaded embedded HTTP web server which uses I/O completion ports to efficiently manage large numbers of requests

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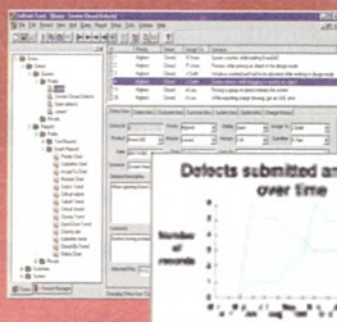
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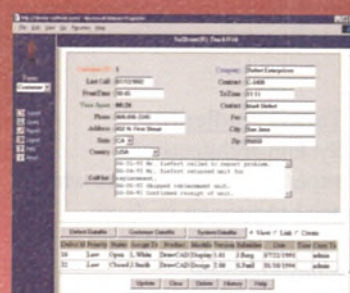
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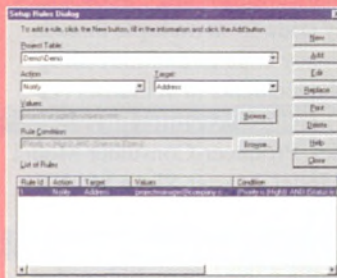
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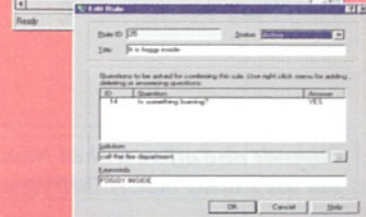
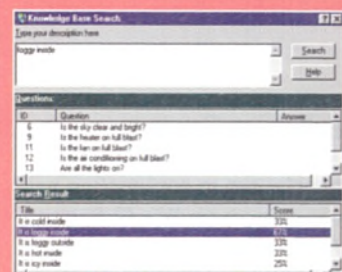
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Another day, another database technology...



Jon Perkins considers Active Data Objects, the latest incarnation of Microsoft's data access strategy.

Each new release of Visual Basic from Microsoft seems to bring with it a new database technology. Now that developers have had time to get used to either DAO or RDO, or both, Microsoft has introduced ADO, which is intended to replace both of them. Not that DAO and RDO have been ditched. They are still there for backward compatibility, and many developers will prefer to stay with the programming interfaces that they are familiar with for some time to come yet. However, Microsoft has invested a lot of time and effort into OLE DB and as a result you will find that the currents of the Microsoft tide will sweep you along in this direction before too long. In this month's column I'm outlining the basic elements of both the technology and the programming model in order to provide a jump-start. I intend to address some of the more complex issues in future columns.

Universal Data Access

It is quite common for Visual Basic developers to specialise in certain areas of technology. One such area of specialisation tends to be the database access model. Depending upon the company technology infrastructure, a developer will normally choose either a local or workgroup-based database via DAO or a client/server database via RDO. It's not uncommon to meet somebody who is a specialist with one model and yet is something of a novice with the other because although the two models are similar they are not identical. ADO is designed to be familiar to users of both models.

As part of the ongoing *Information At Your Fingertips* initiative launched a few years ago, the Universal Data Access (UDA) approach concentrates on connecting with a source of data wherever it resides. At the heart of this concept is OLE DB, a set of system-level COM interfaces that provide a uniform method of retrieving data regardless of its format. This technology is designed from the ground up to provide an efficient method of access to both web-based and multiple-tier client/server data sources. For each source of data there needs to be a corresponding OLE DB provider. Examples of such data sources are SQL Server, Oracle, NT5 directory services, email storage, and mainframes. Probably the most useful provider at the moment is the *OLE DB Provider for ODBC Drivers* (the provider is coded as MSDASQL) which, as the name implies, provides a bridge to existing ODBC data sources. This driver ensures the maximum access to pre-existing data sources.

While it is OLE DB that provides a heavyweight object model to access data of all varieties, it is ADO that provides a simplified language-independent Automation model for consumers. Visual Basic 6 was the first version of this language to introduce an out-of-the-box installation of ADO, although the technology itself has been around for a little while now and is currently running at version 2.0. Some of the improvements in this newer version include added support for Events and persistence of data between sessions, the second of which I'll cover a little later in this article. Microsoft is clearly treating this whole new technology as a key component in its current (intended)

evolution to a serious player in the high-performance operating system arena. For example, the forthcoming, and eagerly awaited, SQL Server 7 makes heavy use internally of OLE DB to the extent that its algorithms are tuned specifically for it.

ADO Object Model

ADO 2.0 is comprised of the following seven primary objects.

Connection: Typically used by Command and Recordset objects to provide a session with a data source, although it is possible to directly pass a Command to the database via the `Execute` method.

Command: The definition of a query or statement that is to be given to a data source. This can be an instruction to execute a bulk operation on some data, retrieve a data extract into a Recordset object, or to perform a management function of the database itself. A Command definition can be either a SQL statement or an invocation of a stored procedure or a view, if appropriate.

Error: Can be created if the OLE DB provider has chosen to implement it, otherwise the Connection object will raise errors into the normal Visual Basic `Err` object.

Field: Logically represents a column in a Recordset object.

Parameter: Implemented as a Collection, and used to store parameters that will then be used by a Command object.

Property: A dynamic characteristic of an ADO object that is defined by the provider. A property can either be built-in, where it is actually part of the standard ADO definition, or it can be dynamic, in which case it is specific to the provider's implementation. An example of a dynamic property could be whether a data source supports transactions. Property collections exist for the Connection, Command, Recordset, and Field objects.

Recordset: Logically contains a set of results from a query made against a Connection object. This is the primary means of manipulating data when using ADO.

The architectural design of ADO emphasises a degree of independence of each ADO object from the others. A Command object, for example, can be associated with a Connection object, executed to return a Recordset object, connected to another Connection object, and executed again to create another Recordset.

Cursors

The Recordset object supports four different cursor types. I'm sure that many EXE readers will be familiar with cursors to some degree or another, but because they are part of the Microsoft Certified Solution Developer syllabus it's worth taking the time to review them again.

Dynamic: The contents of the Resultset reflect subsequent changes made by other users, whether they are record additions, deletions, or modifications.

Keyset-driven: Similar to Dynamic, but only those records captured within the Recordset at the time of its creation are visible. Therefore



any changes to existing records will be seen, but records that have subsequently been added will not be visible. Likewise, records that have actually been deleted will also become unavailable.

Forward-only: Behaves similarly to a Dynamic cursor, but will only support a forward direction through the Resultset. The mechanism behind this approach is optimised for performance.

Static: The contents of the Resultset remain the same regardless of what actually happens to the 'real' data in the underlying table.

The type of cursor is set via the `Recordset.CursorType` property. Predefined constants for the above list are `adOpenDynamic`, `adOpenKeyset`, `adOpenForwardOnly`, and `adOpenStatic`.

Listing 1 provides code fragments for the basic operation of creating a connection, defining a command, and obtaining a Recordset. This isn't the only way of populating a Recordset instance. For example, a Recordset can use the `Open` method to obtain a working set of data.

Lightweight Recordsets

Previously known as the Advanced Data Connector, the Remote Data Service (RDS) is a technology that has been integrated into (and forms a subset of) ADO. It is used as a means of transportation for an ADO Recordset to be passed from a server to a client application. But beware: using this technology means that you do need to understand how to implement tiered – or distributed – applications. Most of Microsoft's documentation on the subject inevitably involves examples that revolve around Internet-based solutions, which in itself is fine because RDS is designed to work over HTTP. However, it does also work over DCOM.

The RDS technology exists in two parts: a server component and a client component. Although these components are available from a variety of sources (including <http://www.microsoft.com/data/ado>) the server component is also installed with Internet Information Server (IIS) 4.0, and the client components are installed along with Internet Explorer 4.x. If you do happen to be distributing a web-based application for browsers other than IE4, then include the `Msadc11.cab` file with your other files. For non-web applications that need to have the client services installed, a Microsoft Knowledgebase article (Q176874)

called *Distributing RDS Client with Visual Basic Setup Wizard* lists the necessary steps to take.

To explain the mechanism with which RDS works we can consider a standard three-tier application. When a call is made from the client tier to the middle tier, it is the job of the RDS client to marshal the request (over HTTP, DCOM, or whatever) to the server-side RDS component. This, in turn, passes the request to the data tier. When the server-side RDS component receives the data that is asked for, it packs the data into an ADO Recordset object and passes it back to the client tier. The contents of the Recordset are then cached on the client computer in order to keep the network traffic to a minimum.

As I mentioned in the Visual Basic 6 article in the September issue of EXE, the ADO system is provided as both a full implementation (ADODB) and a lightweight version (ADOR). The ADODB version should be installed in the middle tier, while the lightweight version is the component that gets installed along with the client application. This lightweight version is designed purely for the implementation of a Recordset without the associated baggage of Command, Connection, Error, and Parameter objects.

Error handling

When writing an error handler for an ADO routine you need to be aware that an error can reside in either the ADO Errors collection or within the Visual Basic `Err` object. The location depends upon how and where the error occurred. If the problem is caused by an error with ADO itself, then the Visual Basic `Err` object will hold the error details. OLE DB-provider generated errors will be populated into the ADO Errors collection if the provider has chosen to support this. Of note here is the fact that ADO stores its errors in a Collection object, implying that there can be more than one message. An error handler should be sure that it extracts each Error object by using a `For Each Next` construct. Only the ADO Connection object exposes the Errors collection.

Data persistence

The logical contents of a Recordset can be persistent between sessions. Data is either stashed or retrieved via the `Save` and `Open` methods respectively. The data is saved between sessions as binary ADTG (Advanced Data TableGram) format. A simple example is shown below:

```
Dim myRecordSet As ADODB.Recordset

' populate myRecordSet, then
myRecordSet.Save "c:\data\mydata.adt", adPersistADTG
myRecordSet.Close

' then, in another session
myRecordSet.Open "c:\data\mydata.adt"
```

Progress

In summary, ADO is a thoughtfully designed progression from the DAO and RDO object sets, while OLE DB is a powerful new technology that forms an integral part of the forthcoming SQL Server 7 and will no doubt be part of the base Windows NT specification before too long. In most cases I would imagine that there would be no point in retro-fitting ADO into a software development project that is already underway, but it is probably worth making the move on the next project. ■

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

```
Private Sub Command1_Click()

    ' "Look ma, no error handling!!"

    Dim sConnect As String
    Dim adoConn As ADODB.Connection
    Dim adoCommand As ADODB.Command
    Dim adoRecordset As ADODB.Recordset

    ' Define and open connection
    sConnect = "driver={SQL Server}; _
        & "server=homer;database=pubs;uid=sa;pwd="
    Set adoConn = New ADODB.Connection
    adoConn.ConnectionString = sConnect
    adoConn.Open

    ' Define a Command and obtain a Recordset
    Set adoCommand = New ADODB.Command
    adoCommand.CommandText = "Select * from authors"
    adoCommand.CommandType = adCmdText
    adoCommand.ActiveConnection = adoConn
    Set adoRecordset = adoCommand.Execute
    Do While Not adoRecordset.EOF
        ' do something with the data, e.g
        Debug.Print adoRecordset!au_fname
        adoRecordset.MoveNext
    Loop

    Set adoRecordset = Nothing
    Set adoCommand = Nothing
    Set adoConn = Nothing
End Sub
```

Listing 1 – One way of getting data from ADO.

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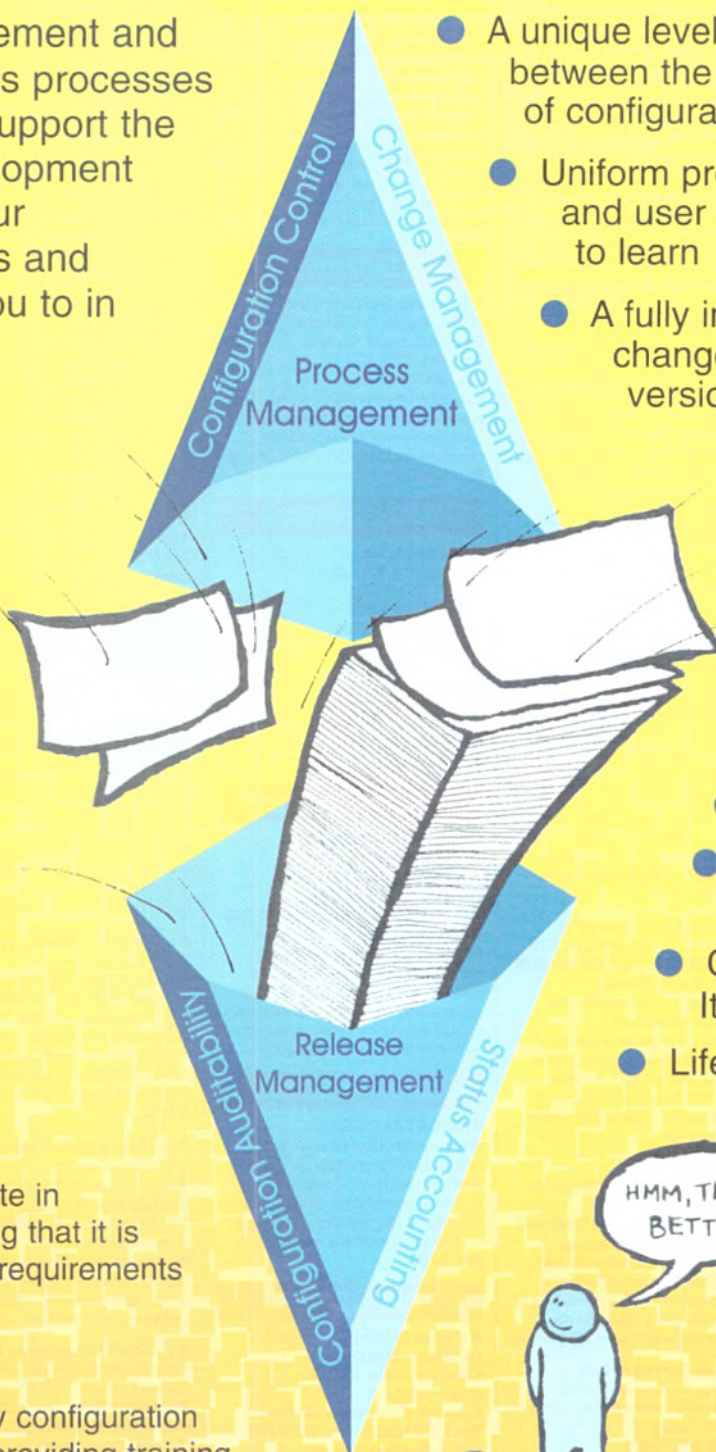
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Contact: Roy Davidson (Sales)
Tel: 01823 352357 Fax: 01823 352358
www.des.co.uk
deskey@silver.cityscape.co.uk
DES manufactures software security products developed as a solution to software piracy and theft

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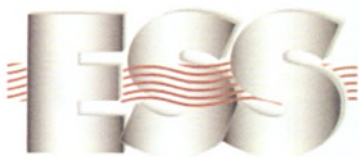
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- A strong knowledge of C and preferably C++
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West London/Buckinghamshire/Berkshire

£18k-£50k + benefits

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Please contact Ian Coles for further information



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to look a little
deeper to see
what is really
going on in
the world today.

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City

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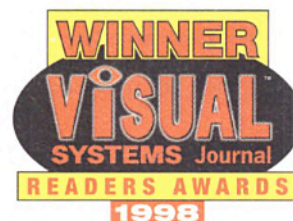
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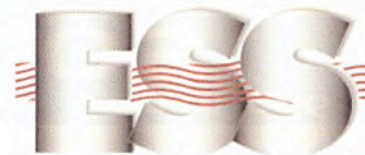
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Ref: EP321

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Salary: c£40k

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Salary: c£40k

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E349R

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Software Engineer

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Ref E343R

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BATH

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

(Ref:X/8685)

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WORCESTERSHIRE

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(Ref:PS/9031)

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

VB/DELPHI

0117 988 0000 • Peter Bennett

GROW WITH THE COMPANY

BRISTOL

TO £30,000

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

(Ref:PB/6395)

SENIOR VB DEVELOPERS

GLOUCESTER

TO £30,000 +BENS

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

(Ref:PB/8424)

DELPHI DEVELOPERS

BRISTOL

TO £32,000

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

(Ref:PB/9030)

VISUAL BASIC GAIN MCSO

DORSET

TO £38,000

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

(Ref:PB/6152)

SHEER BRILLIANCE

WILTSHIRE

TO £27,000 +BENS

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

(Ref:PB/8950)

ACCELERATE YOUR CAREER!

DORSET

TO £35,000

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

(Ref:PB/8988)

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

C/C++

0117 988 0000 • Robin Hunt

QUALITY OF LIFE

SOMERSET

TO £45,000 +BENS

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

(Ref:RH/7389)

LEADING-EDGE TECHNOLOGY

BRISTOL

TO £30,000 +BENS

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

(Ref:RH/8714)

COM/DCOM SPECIALIST

WILTSHIRE

TO £35,000 +BENS

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

(Ref:RH/9021)

SAVE THE ENVIRONMENT

DORSET

TO £37,000 +BENS

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

(Ref:RH/8616)

CLASS OF ITS OWN

WORCESTERSHIRE

TO £35,000 +BENS

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

(Ref:RH/8973)

C/C++ SENIOR ANALYST PROGRAMMERS

BRISTOL

TO £35,000 +BENS

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

(Ref:DV/8008)

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

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The ultimate thin client?

Corporate America has defined a lower cost alternative for Windows/Macintosh systems that also addresses the Y2K (Year 2000) issue.

The goal is to remove all computers from the desktop by January 1999. Instead, everyone will be provided with an Etch-A-Sketch. There are many sound reasons for doing this:

- No Y2K problems.
- No technical glitches keeping work from being done.
- No more wasted time reading and writing emails.
- Reduced support costs – as demonstrated by the following text.

Frequently asked questions from the Etch-A-Sketch Help Desk

Q: My Etch-A-Sketch has all of these funny little lines all over the screen.

A: Pick it up and shake it.

Q: How do I turn my Etch-A-Sketch off?

A: Pick it up and shake it.

Q: What's the shortcut for Undo?

A: Pick it up and shake it.

Q: How do I create a New Document window?

A: Pick it up and shake it.

Q: How do I set the background and foreground to the same colour?

A: Pick it up and shake it.

Q: What is the proper procedure for rebooting my Etch-A-Sketch?

A: Pick it up and shake it.

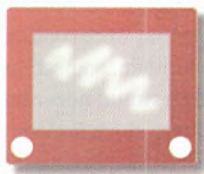
Q: How do I delete a document on my Etch-A-Sketch?

A: Pick it up and shake it.

Q: How do I save my Etch-A-Sketch document?

A: DON'T pick it up and shake it.

Thanks to Mark Cole and Dave Dorrell for supplying us with this (hopefully) fictional tale.



Freebie of the month

Recently, we received a bag full of gold coins in the post. You can imagine how excited we were. One member of the team had whipped out his Windows Calculator and began totalling up how much each of us could expect to net. The celebrations continued for a full ten minutes until someone spotted that the coins were, in fact, made of chocolate. Anyway, the coins were accompanied by a fake 200 Euro note (we would have used the Euro currency symbol here,

but we couldn't remember how to get it in Word, and besides, it looks silly) in promotion of MicroFocus's

line of Euro-conversion tools. There was also a rather nice lunch laid on, apparently, but since we had

to stay in the office slaving over another feature-packed issue of EXE, we had to miss it. That's how dedicated we are.

Once the shock of missing out on all that gold had worn off, we even tried eating the coins. And very nice they were, too. Any other companies with similarly edible promotional products to spare are welcome to send them to us. Milk chocolate only, of course.



Blast from the past

Oh, how your words can come back to haunt you... in the true spirit of Christmas (yes, we know that's next month, but there's only so many clichés you can use) we dug up this impressive bit of prognostication by dashing ex-ex-editor Will Watts (we've abridged it slightly to make it seem even more embarrassing). Sorry, Will!



'... It is five years since I first saw a GUI running on a PC. By 1990, said the magazine editorials of 1985, we shall all be utter WIMPs: forever resizing windows and double-clicking like good 'uns. (It was always WIMP in those days, GUI seemed to come much later, perhaps because buzzwords, like lithium batteries, wear out after a few years, and must be replaced with an equivalent.) Our keyboards, said the pundits, will shrivel and drop off from lack of use. And at the time, to a naïve Tomorrow's World believer like myself, this seemed almost as plausible as cheap, safe nuclear power...

...The reasons for the failure of GUI on the PC – for failure is what it is – are various...

...Windows, although it has enjoyed more success recently, and is about to be upgraded again, has always had a slight smell of death to it... OS/2 V2.0 requires 6 (six!) MB of RAM to run; your software will need to be spectacularly good to justify your customer's hardware investment.

... And so comes the dismal realisation. It's not that GUI hasn't really happened for PC-class machines; it is the feeling that it is never going to happen... Any window (sorry about that) of opportunity for creating a de facto PC standard has passed.' [EXE, May 1990]

And finally

CtrlBrk recently went to see *The Truman Show*,

a film in which – shock, horror – Jim Carrey is actually very good.

Obviously we don't wish to spoil the ending of the film for you, but the butler did it. Or did he? Nevertheless, we wondered why people might find the idea



of a 24-hour TV show of someone's life so far-fetched.

After all, aren't the many and varied web cams to be found around the Net just that? Setting aside those cams that appeal mainly to, ahem, prurient interests (the clear majority, it must be said) there are many cams that are, simply, televising someone's life, warts and all. Although these cams are not stage-managed in the same way the Truman Show is, it's only a matter of time. Indeed, at least one TV channel has set up its own stage-managed web cam, although given the quality of most of that channel's programming it's probably safe to say that you wouldn't want to watch it for long before moving on.

Surely it can't be too long before some bright spark has the idea of setting up a TV channel which shows nothing but a constant cycle of feeds from the literally tens of thousands of CCTV cameras which litter the city centres of Britain. Hmm... BritCam. I can see it now. Meanwhile, why hasn't anyone set up a web cam to appeal specifically to software developers? How about the CodeCam – 24-hour green-listing-paper reams of 20-year old COBOL code, with occasional snippets of other prehistoric languages – 'Call in and win when you spot PL/1!' – just to see if you're awake. Or the CubicleCam – non-stop images of Microsoft programmers beaver away at the next version of Windows NT, pizza, Jolt Cola, and all. Now there's one that could run and run... and run.

Cringing for Bobbo, or how I learned to stop worrying about the quality of my work and just made dreary TV programmes instead.

Robert X Cringely, once best known here as the writer of a very sharp and witty history of the PC, these days seems determined to recast himself as a presenter of increasingly dull Channel 4 television programmes. Verity Stob respectfully asks him to reconsider this career move.

Blairish electric guitar theme tune over cheap, under-animated title sequence. Title: 'The Geeking of the Nerds'. Opening shot – a suspiciously youthful-looking and bespectacled man eating a pizza in a restaurant on his own.

Cringely (for it is he): Hi, and welcome to the Fredoes Café in San Diego, California. This restaurant may not look like much, but it is right here that one of the most significant inventions in the history of the PC was made. But before we find out about that, let me introduce my assistant for this series.

A girl is matted into the shot, using a really strikingly poor chromakey technique. The girl is incorrectly lit, the wrong size for the perspective, her feet don't touch the floor, and a nasty fuzzy line surrounds her image.

When the girl speaks, we discover to our increased embarrassment that she is a Brit, apparently of the not-quite-bright-enough-to-get-on-Blue-Peter school of media studies. The girl addresses herself to a point quite near Cringely's right ear...

Girl: Hi Bob and I'd just like to say how great it is to be here. Only I'm not really here of course –

Cringely (looking some way to the left of her left shoulder, and perhaps beginning to realise that Bob Hoskins earned his money in *Roger Rabbit*): Yes –

Girl (plonking tone): I'm only *virtually* here. I'm actually in Birmingham. In the studio. But using the magic of the Internet –

Cringely (interrupting firmly): But to find out why Fredoes is so significant we have to travel north –

Girl: So why is Fredoes so significant, Bob?

(Cut to shot of Cringely driving a convertible sports car slowly along the freeway.)

Cringely: Back in 1978, one guy, working in a pretzel store in Silicon Valley, had an idea. An idea that was to change millions of lives, and earn billions and billions of dollars.

(Pulls car off freeway, parks in front of 'Just Pretzels' pretzel shop. Fat, elderly man with pleasant avuncular appearance, presumably

the proprietor of the shop, leans in the doorway. Caption: Jack 'Pretzel' Larkin.)

Cringely: Hi. I'm Bob Cringely.

Jack Larkin: Hi Bob. Would you like to come in and interview me for British Channel 4?

Cringely: Do you mind if I come in for a moment?

(Cut to interior of shop. Cringely is seated at a small table, Jack is serving him pretzels.)

Cringely: Mmmm. I'd like one of those...

Cringely (on voiceover): But in 1978, it was a lot more than just pretzels that were cooking in Jack's store. Something really big was about to happen, something that would change the world forever. And this thing would never have happened...

(Cut to stock footage of Xerox PARC. A man with a really horrid 1976 haircut is playing PONG on an Alto.)

Cringely: ... if it hadn't been for Xerox PARC. Boy, those guys at Xerox PARC thought of everything!

(Cut to Cringely's garage, which is ostentatiously furnished with an original IBM PC, a first generation Apple Mac, an Apple II, etc etc.)

Cringely (Standing in front of whiteboard): Time for another Bob Cringely crash course in high tech basics. Pay attention now! (He simpers.) You see, before 1978, everybody thought of a computer as one big box. (Draws a big box on whiteboard.) That is everybody except one man. (Draws a stick man.) Can you guess who that man was?

(Cut to stock footage of Bill Gates, being interviewed by an unseen party who one suspects isn't Cringely.)

Gates: Yeah, well it's all very well you saying that, but what people don't realise is that in those days this kind of stuff was hard to do. And expensive. And we made the policy decision that, yeah, we're gonna go for it. And we did.

Cringely (voiceover): No, not him. He didn't come along until *much* later. (Cut to shot of Cringely, pedalling an ice cream vendor's tricycle along a beach.)

Cringely (addresses camera in cod Italian accent as he pedals past): Getcha tutsi frutsi ice cream!

Cringely (voiceover): I've come here to Malibu to meet someone very special.

(Cycles up to a beach villa, and knocks at door. Door opens instantly, to reveal fat, elderly man in Hawaiian shirt and shorts.)

Man in Hawaiian shirt: Hi Bob. Would you like to come in?

Cringely: Hi. My name's Bob Cringely. Can I come in?

Man in Hawaiian shirt: Better get your ice cream out of the sun, in case it melts!

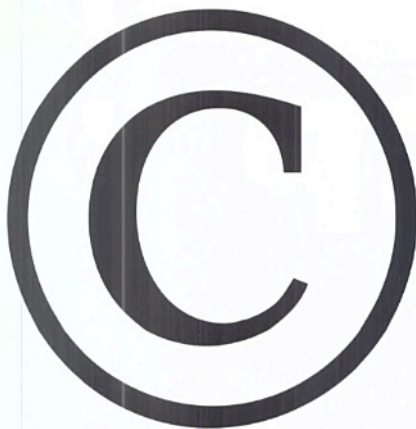
(Both parties turn to camera and laugh.)

(Cut to the British *Blue Peter* girl, whom we had hoped the director had forgotten about, standing in a street of British terraced houses.)

Girl: Meanwhile, back in '77, things were hotting up here in the UK. I've come to Birmingham to meet the programmer who really set things rolling. Let's see if anyone is at home.

(Presses doorbell, door opens immediately.)

(etc etc etc etc etc)



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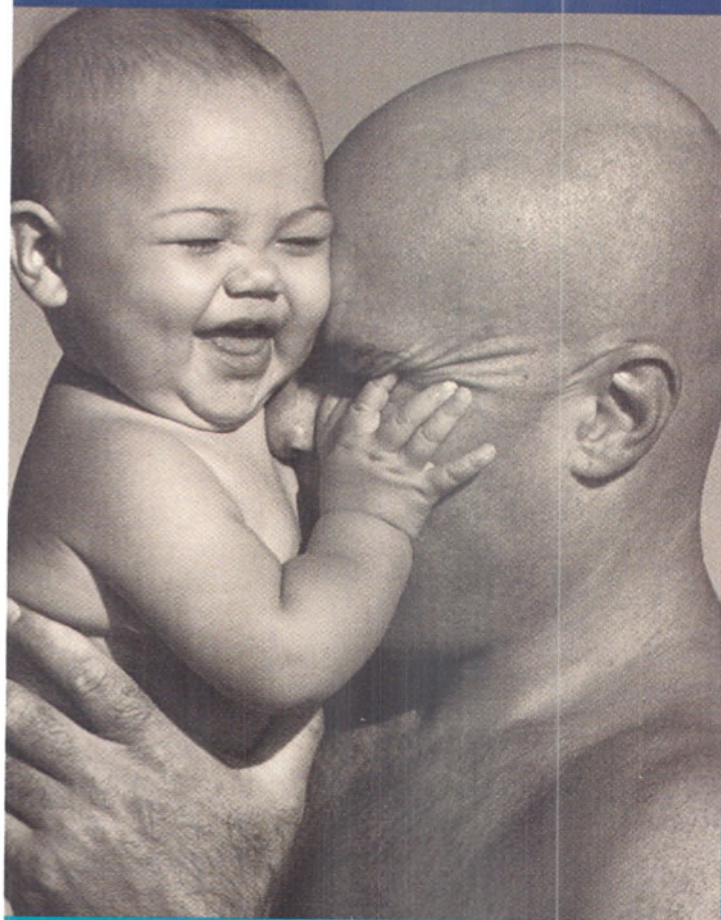
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