

# EXE

MARCH 2000

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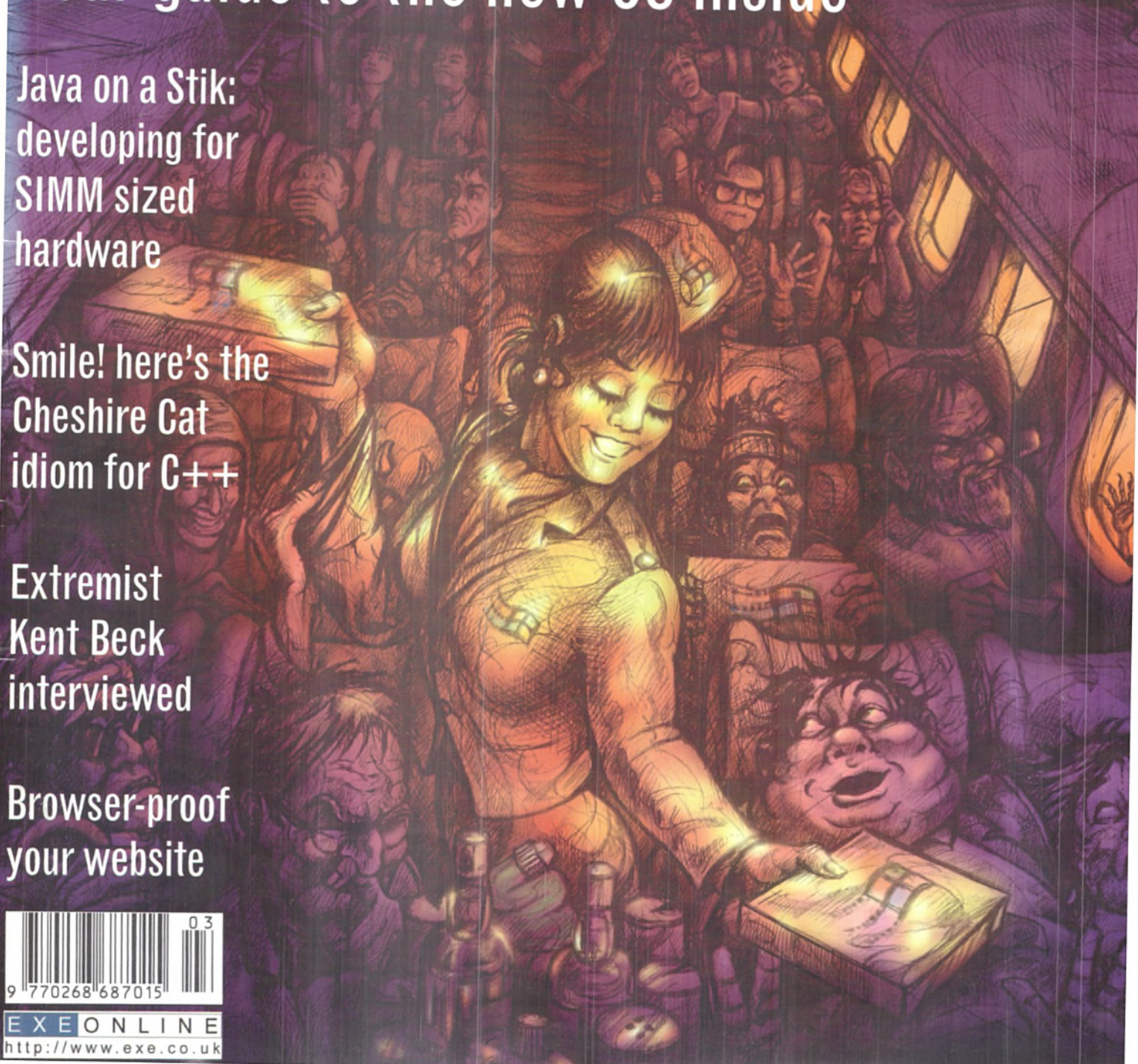
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idiom for C++

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Visual Basic Learning	13078	£78
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Visual SourceSafe	13499	£375
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C++Builder Std	15126	£80
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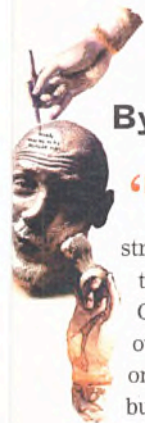
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## Bye bye Borland

**T**True or False?" asked M as we strode down the corridor; the day after the Corel/Borland takeover news broke. 'When one struggling company buys out another struggling company, that makes a "powerhouse"?' He made the quizshow 'wrong answer' buzzer noise. 'I don't think so.' Oh dear. Hard pressed Borland users, who have suffered a fair amount over the years, must now face yet another trauma. What are the prospects?

Corel is a company that already has many similarities and connections with Borland. Most obviously it is the last resting-place of the Borland Glory Days applications Paradox and Quattro Pro. (Thus Corel's developers are key users of the notorious BDE, which fact inclines long-term Borland users to instant sympathy.)

Both companies had their big moments of glory in the late 1980s. Corel was busy grinding out the first decent drawing tools for Windows when all the allegedly smart money was porting half-hearted Mac versions or, even worse, writing for OS/2. CorelDRAW was originally one of those feel-good applications: compact, speedy, sharp. It was the Turbo Pascal of vector graphics. True, some releases have been less crisp – the Curse of Version 4 struck with a vengeance – but DRAW is still the best of class to this day.

Latterly, both companies liked jumping on fad-wagons to escape Windows. Who was it that demonstrated to everybody's satisfaction that Java wasn't to be taken seriously as a system for developing GUI applications? Surely it was Corel, which ported WordPerfect to Java and public-spiritedly displayed the result on its website, so that everyone could download it and

marvel at its glutinous slowness. Even before the current merger, both companies were looking to Linux as their big chance: Corel with its own easy-to-install Linux distribution and Borland with Linux ports of Delphi and C++Builder.

However, there is one important difference between Corel and Borland. Corel is not burdened with Borland's credibility deficit. Corel bought WordPerfect *after* Novell had gone bananas with it, when it was cheap; c/f Borland and Ashton Tate. Corel has resisted the temptation to rename itself 'Coreprise'. As far as I know, Corel has never grown a Stonehenge-shaped hedge at its headquarters. Corel can add steadiness and sensible, consistent marketing to Borland's undoubted technical wizardry and, with a bit of luck, users of Borland tools will finally be able to stop worrying about where their next version is coming from. We wish the 'Linux Powerhouse' the best of British.

## Of safety belts

I was lurking in an online Windows development conference and the old C versus Pascal *jihad* broke out. But while hotheads were quoting *Why Pascal is not my favorite language* and, probably, the *Protocols of the Elders of Zion*, a few more considered threads emerged, including one concerning default exception handling.

If you write a bog standard MFC application and code a button handler like this:

```
void CTestDlg::OnButton1()
{
    int x = 0;
    int y = 1 / x; // Oops,
    // have divided by zero
}
```

when the punter clicks the button, the program will display a modal dialog and die.

If you do the equivalent thing in Delphi:

```
procedure TForm1.BtClick(
    Sender: TObject);
var
    x, y : Integer;
begin
    x := 0;
    y := 1 div x; // Bang!
end;
```

the program complains with a similar dialog, but lives. Delphi's default response to an exception is to terminate handling of the current Windows message, but to continue running. (I do accept that MFC can be made to behave like Delphi and vice versa, by the way. The argument is about choosing a sensible default for a GUI application whatever tool is used to create it, not specific language or library features.)

Backers of the MFC style assert that, if an exception occurs, the best thing to do is to end the application, perhaps logging debugging information. Delphi-types say that to end an app and trash the user's work because there is a minor coding error is way over the top – the reaction is out of proportion with the problem. Aha, say the Visual C++ people, but what about when there is a timer message involved? We've all seen Delphi applications running amok, filling the screen diagonal with out-of-control modal dialogs. Not as many times as a Visual C++ app has trashed three hours' work because of a tiny bug in a field validation routine of some obscure dialog, replies the Delphi contingent.

The analogy that clarified the issue for me actually came from a C++ proponent. He said: 'Isn't this just like the old thing with seatbelts in a car: everybody knows somebody whose brother-in-law's mate survived a crash because he wasn't wearing a belt and was thrown clear.'

A fascinating choice of parallel. When first introduced, seat belts met with huge cultural resistance, with the 'thrown clear' point the central plank of the anti-belters' argument. But in the event, accident statistics

since the introduction of safety belts have shown this argument to be unmitigated spherical objects. It turned out that being thrown clear hadn't been saving people. In fact being thrown against the windscreen had been the big killer.

Visual C++ users are not serving their customers well when they worry about the bad effects of strapping in app code with decent exception handling. Honestly, folks, you aren't doing your users any favours by letting them be thrown clear. All that is happening is that they are getting their heads full of windscreen glass.

In short, VC++ programmers should just belt up. ; -)

But what do you think?

## BCNU

As he acrostically announced in last month's *SoapFlakes*, David Mery has left the Editorship of this magazine after nearly five years to take up a position with the PDA software house Symbian. A particularly appropriate employer for David, who was browsing the Net down the pub using his Palm Pilot, his mobile and a cordless infra-red link back in the days when the rest of the world still thought digital watches were a pretty neat idea. David has been a fierce and relentless defender of EXE's editorial independence, and has injected the old mag with his unique sense of humour and (sorry David) a certain Gallic style. We would like to thank him for all his efforts over the years, and to wish him the best of luck in his future endeavours. ■

Will Watts

PS. Hope to see you at JaCC 2000 in Oxford later this month: as always tip top speakers, a friendly atmosphere, brain food galore and all at the fraction of the price you can pay for a dreary Death by PowerPoint at, cough, certain lesser bashes. Check out [www.exe.co.uk/jacc/](http://www.exe.co.uk/jacc/).



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# C++Builder 5 BC (before Corel)

The last major Hurrah from Borland before the Corel merger was a new release of C++Builder. It may only seem like last month that we got our hands on C++Builder 4, but it's a year since borland.com launched with a new version of the C++ RAD system. Whereas that release majored on STL and Corba support, getting to the Web faster is the main thrust of version 5, together with the incorporation of Microsoft technologies such as COM+ and SQL Server 7.

As well as XML support for the exchange of Web data, an InternetExpress feature includes a Web Client PageWizard and the MIDAS PageProducer. A WebBroker includes ASP support – an Active Server Object Wizard helps create interactive server applications for ASP-based sites – and a WebBridge. The latter allows programming to a common API for NSAPI, ISAPI and CGI, in theory protecting code as standards evolve.

CodeGuard is a runtime error-detection system for diagnosing memory related resource leaks – there is monitoring of new, delete, malloc and free – and there is Just-in-Time debugging.

In terms of databases, ADOExpress has complete support for

ker ORB 4.0 is included. The Enterprise edition includes the TeamSource source code control system familiar to Delphi users (see *Delphi*, EXE, January 2000).

At the core of the system is version 5.5 of Borland's C++ native code compiler (BCC), which is now available for free download.

System recommendations include a P166 processor, 64 MB of RAM and 388 MB of disk space for a full installation (the compact installation is 120 MB for Standard). It runs on Windows 2000, 9x and NT4.0.

There are three editions: Enterprise, Professional and Standard. The ESPs for new users are \$2,499, \$799 and \$99 respectively. For a full feature matrix, see the C++Builder Web page.

The recent practice of including last-but-one releases of Java and Delphi has been followed.

[www.borland.com/bcppbuilder/productinfo/feamatrix/](http://www.borland.com/bcppbuilder/productinfo/feamatrix/)

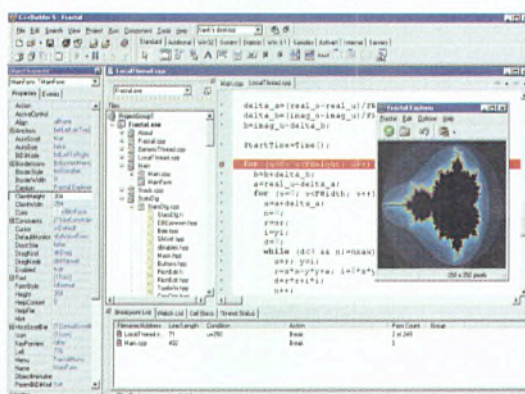
**NuMega DriverStudio 1.5** is a suite of tools for the development of **device drivers** for all Windows platforms, including **Windows 2000** (development, debugging, tuning, testing and deployment). Version 1.5 sees code coverage analysis for kernel mode drivers (in TrueCoverage Driver Edition). [www.numega.com](http://www.numega.com)

**Measurement Studio** is a set of tools for building measurement applications, involving data acquisition, **analysis** and visualisation. Components include LabWindows/CVI (tools for ANSI C), ComponentWorks (tools for VB) and a **Visual C++** application wizard and a set of OO C++ class libraries for measurement apps. It costs £1,700. [www.ni.com/mstudio/](http://www.ni.com/mstudio/)

**GemStone** has expanded its range of Java-based **application server** products. In addition to the Component Edition, the Enterprise Edition and Commerce Automation Edition there is a GemStone/J **Web** Edition, which supports JSP, load balancing (through pooling of VMs, servlets, and JDBC connections) and sharing of HTTP session state. [www.gemstone.com](http://www.gemstone.com)

The **Unify eWave Studio** is a **Web** content development environment that allows you to build Java-based Web and e-commerce applications. Using drag and drop there is support for JSPs and EJBs and the automatic generation of JavaScript, **Java** and HTML. For Windows 9x and NT it is \$1,000 per developer. [www.ewavecommerce.com](http://www.ewavecommerce.com)

**Macrobot 1.0** is another tool in **Watchfire's** line of Web testing products. It records test activities and automatically generates **test** scripts (JavaScript output is available for inspection). V1.0 is \$2,995. [www.watchfire.com](http://www.watchfire.com)



ADO-based access to relational and non-relational data (such as email), and in addition to SQL Server 7, Oracle8i can be accommodated (in Enterprise editions only). For distributed computing, version 5 allows the building of Corba 2.3-compliant servers and the VisiBro-

## Messaging made easy, the JMS way

'Decoupled development' and built-in scalability is the intention behind **SonicMQ**, Progress Software's 100% Java messaging system. Officially launched in Europe at CeBIT, it is **JMS** (Java Message Service) 1.1 compliant, which is part of Sun's J2EE platform. A messaging layer that takes care of implementation details, it is designed to be plugged in under the cover of an application with JMS providing a standardised API. As well as Java, there is support for the use of ActiveX clients along with C/C++ and Progress 4GL interfaces.

In conjunction with the use of XML (Progress has subclassed the standard JMS TextMessage type to include XML messages, and a built-in parser allows you to access the objects through DOM), Progress is emphasising the widespread applicability of messaging.

The system maintains an intelligent broker structure through which clients communicate by sending and receiving messages. Its communication layer should save you from focussing on (or even re-inventing) the plumbing of the underlying network and its comms protocols. Such messaging can occur between the modules of a single system; it doesn't have to be between separate machines. It supports guaranteed delivery of messages via 'durable subscriptions', which is useful for intermittent or mobile clients. A Developer can be downloaded from the Web and allows you to build small-scale systems, without deployment capabilities. It can be layered on TCP/IP, HTTP or SSL.

**SonicMQ** handles two models of messaging: publish & subscribe and point to point. It runs on NT and Unix platforms.

[www.sonicmq.com](http://www.sonicmq.com)

## Linux powerhouse

'The creation of a Linux powerhouse'. This is the stated intention behind the \$2.44bn merger of Corel and Inprise. Speaking on a webcast to accompany the announcement, Corel's Michael Cowpland spoke of the intent to provide a 'single source for Linux', with a range of productivity applications, development tools and professional services. This won't preclude any development for Windows or other major platforms, but was intended to provide a 'smooth transition to Linux' for up to 55 million users. (He identified a total of 50 million users of Corel tools and 5 million users of Borland's development tools.) The combined organisation will be known as Corel-Inprise will operate as a wholly-owned subsidiary of Corel. Dr Michael Cowpland will remain as president and CEO, while Dale Fuller will be appointed as chairman of Corel's board.

[www.borland.com](http://www.borland.com)



# Developer Tools? - Look No Further.

ChiliSoft ASP is the Web application platform you want on the platform you need. ChiliSoft ASP is a platform-independent implementation of Active Server Pages (ASP), the de facto standard for Web applications.



The ChiliSoft ASP architecture is ideally suited for leveraging your in-house skills and making developers of every skill level productive. Plus, ChiliSoft ASP is fully extensible, allowing you to tie into everything from legacy systems to the newest Internet standards.

**Special Introductory Offer**  
For the month of March 2000 you will receive 50% discount on your purchase of ChiliSoft Active Server Pages for Linux

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Visual InterDev 6	£375
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Visual J++ Pro/upgrade	£375/149
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Visual Studio Enterprise/upgrade	£1065/729
Visual SourceSafe 6	£370

Note: QBS participates in Microsoft Open License Program (MOLP) which saves you money. Please call for MOLP pricing.

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Borland TeamSource	£122
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Dart Power TCP Secure Tool NEW	£650
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WhatsUp / WhatsUp Gold	£220/730
WinFax Pro 1/5 user	£90/349
WinINSTALL	from £495
Zetafax	from £315

## POWERBUILDER

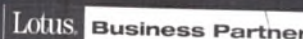
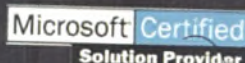
PowerBuilder 7 Desktop/Pro	£185/1075
PowerBuilder 7 Enterprise	£2650
PowerTCP Add-on for PowerBuilder	£99

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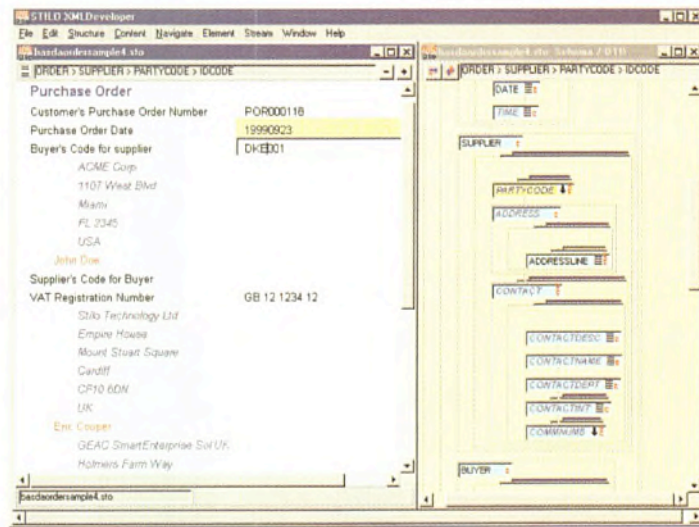
# XMLDeveloper seeks validation

Stilo XMLDeveloper is a tool to create, edit and validate messages within the testing stages of XML application development. Stilo sees the creation of messaging systems in XML as underpinning the majority of e-commerce systems.

When messages are created for testing against an existing schema, the schema is validated by the tool and a graphic representation can be displayed. Test messages can be subsequently created using XMLDeveloper such that valid XML is automatically generated, conforming to the given schema. For multiple test messages, the tool can support a cut-and-paste technique or a 'forms type' interface generated from customisable stylesheets.

For the case when there is no schema, XML Developer creates well-formed XML messages 'on the fly' and can generate a corresponding schema definition and view based upon the single message instance. This schema 'prototype' can subsequently be edited by XML Developer or another third-party tool.

For team work, XMLDeveloper can build test messages from multiple parts. It splits workloads between multiple developers by cre-



ating templates for schema fragments, which can then be imported into a larger schema structure.

In terms of error reporting, all the information displayed is context sensitive—the tool will only display information relevant to the element or point at which editing is taking place. Namespace and Datatype support enables the inline validation of element content when working with datatyped schemas.

To accommodate the need to store and manage messages in a central repository, such as Visual SourceSafe, the XMLDeveloper API

allows you to 'plug-in' a DLL containing the interface to a specific repository.

For Windows 9x and NT, Stilo XML Developer costs £250 per single-user.

According to Neil Hutson, BizTalk Applications Architect for Microsoft EMEA: 'Stilo XML Developer fills a gap in the software tools market and addresses an essential part of the XML development process by automatically creating and validating conformant XML within the testing stages.'

[www.stilo.com/xmldeveloper.htm](http://www.stilo.com/xmldeveloper.htm)

## A soapy ORB

As well as providing XML access to Corba-based apps through the Simple Object Access Protocol (SOAP) in Windows DNA 2000, the main features of Rogue Wave's Nouveau 2.0 include support for Linux, full integration with the latest version of Rogue Wave's libraries (Standard C++ Library, Threads.h++ and Tools.h++ Professional), and a scalable Corba event service for asynchronous communication.

There is support for the Corba object-by-value (OBV) custom value type, which provides you with the ability to pass objects by value and more easily distribute complex data structures. Available for Windows immediately.

[www.roguewave.com](http://www.roguewave.com)

Software AG has announced a wide-ranging architecture for XML-based applications. The X-Studio component will be a general integration of third-party XML tools: schema editors, stylesheet processors, and an IDE. X-Machine and X-Node components are currently available as part of Tamino, Software AG's information server. It's due to be completed later in the year.

[www.softwareag.com](http://www.softwareag.com)

InstallFromTheWeb 3.1 features a new interface that is consistent with that for InstallShield Professional 6. For Web-enabled installations, this allows the entire download and installation cycle to appear as one process. It costs £490 (upgrades £244).

[www.installshield.com](http://www.installshield.com)

InstallShield Java Edition 3.0 is a new version of the cross-platform installation system. Java applications can be installed without requiring a pre-existing JVM on the end-user's machine. Installation can take place – to any specified JVM – in one step. There is enhanced deployment to Solaris. Version 3.0 will be available for £490.

[www.installshield.com/java/](http://www.installshield.com/java/)

KL Group has updated its JClass Java component libraries. V4.0.1 has IDE integration for VisualAge for Java 2, platform support for IRIX and Linux and full JDK 1.1 support in JClass PageLayout. Pricing starts from £391 for JClass JarMaster.

[www.programmers.co.uk](http://www.programmers.co.uk)

The Delphi profiler ProDelphi has been updated to version 7.3. As well as a couple of bug fixes, the professional version can now track 16,000 methods (from 10,000 before) and there is enhanced accuracy for nested procedures on Intel processors. A Professional version costs \$49.

[www.hp.europe.de/prodelphi/](http://www.hp.europe.de/prodelphi/)

## From XML to B2B

Object Design has renamed itself eXcelon, after its XML-based development environment. This change has accompanied the release of its eXcelon B2B Integration Server together with some industry-specific B2B Industry Frameworks. It reflects a concentration on business-to-business e-commerce, but the company will still be involved in the object databases arena.

Building on eXcelon 2.0 – with its XML development tools – the B2B Integration Server is a suite for building and deploying specifically B2B systems – where businesses not only exchange data but extend internal processes to involve multiple partners.

The server includes a B2B Translator which manages the various manifestations of XML (cXML, BizTalk, etc) and a Business Process Workflow engine, for the specification of the processes to be observed, eg 'When manufacturing begins an acknowledgement will be sent'. Also, an Enterprise Application Integration module supports over 80 kinds of data formatting translations.

The company believes XML has become the lingua franca of B2B commerce and has created an XML resource centre on its website with articles, FAQs and other XML-related links.

Typical installations of B2B Integration Server start from \$80,000.

[www.exceloncorp.com/xml\\_resources/](http://www.exceloncorp.com/xml_resources/)







The future is not as scary as it used to be.

The future hasn't been written yet. That's up to you. And it starts here with Windows DNA. A blueprint that not only works with any system, but evolves with it. Letting you build Internet applications faster and easier than ever before. Suddenly, the future doesn't seem quite so alien. For more details visit [www.microsoft.com/uk/dna](http://www.microsoft.com/uk/dna)

**Microsoft**

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# Too thin, too bad

For once, a development in IT has not been eagerly seized by all concerned. Instead, it has faded quietly away. Jules investigates Thin Clients.

In the days before computers, when office workers had no more than a typewriter and an adding machine, the task of office maintenance was much easier. Machines went wrong, the worker would be docked half a day's wages for the breakage and the machine would be replaced with an identical model. Can you imagine the maintenance nightmare if one person's adding machine looked like a coffee dispenser and the next one looked like a scale model of the Cutty Sark?

That's precisely the problem facing every IT manager today. Employees need computers on their desks to do their jobs. On the other hand, not since the invention of television has such a thoroughly time-wasting device been seen. Users fiddle with their desktop settings, changing the appearance of every single control. Every machine makes different noises. Every machine has different bits of junk lying around on the desktop, and every machine has different shortcuts. By gentle fiddling with everything available, users eventually personalise their machines to such an extent that nobody else can even find the start menu.

That in itself wouldn't be so bad, if only the machines weren't so flaky. Every time the hard disk fills up, its back broken by yet another pornographic picture for the rolling screensaver or another mammoth mail attachment which is about to be forwarded to the recipient's entire contact list, every time someone installs yet another dodgy copy

of *Leisure Suit Larry in the World of the Office Party* and thus releases the same old virus onto the network, and every time someone tries to merge their personal address book with the indigenous Outlook file, an engineer gets called. The engineer is faced with a series of cryptic clues of mind-numbing complexity ('The Mayfly is the wastebasket - it's obvious! What do you mean, you can't see it? It's the thin spidery thing that gets squashed when you put a document on it.') before he can begin the task of cleaning up a machine that is kaput only because of the incessant and inane fiddling of the user.

Why do machines go wrong? The people who sell the machines will tell you: it's because users fiddle. After all, the machines were fine when you bought them, weren't they? If you want to stop machines from going wrong, you've got to stop the users from fiddling with them. Sun, in particular, showed us how; boot into a single office application instead of a task bar, and don't permit any changes to be made to the profile settings of the machines. Remove floppy drives and CD drives from the workstations (because holes let viruses in).

They called the idea 'Thin Clients' and they trumpeted it as the next big idea. In essence, they made a stripped-down diskless PC that remote-booted into a browser, and connected it to an intranet with all the data and all the key software running on the servers. It meant you had to invest in a complete new infrastructure (based, of

course, on Java), but you got fiddle-proof machines. A few companies were wooed by the idea and I saw a couple of sites where diskless workstations (described as Thin Clients) were running DOS programs.

Nobody seems to have made the point, while the trumpeting was going on, that this wasn't a new idea at all. Mainframes, which timeshared between multiple dumb terminals have been in use probably since the fifties (and certainly since the sixties). Read 'Server' for 'Mainframe' and you know pretty much all there is to know about Thin Clients.

Machines used to be built like this because computers were very much more expensive than terminals, and the disadvantages were dwarfed by the economics. Since the deployment of the PC, users no longer get left in the lurch when the mainframe throws a wobbly, three people doing something at once no longer reduces everyone to ten minute transaction cycles, and whole buildings are no longer blacked out by a cabling fault. The PC has shown us all what interaction is really about, and even one-second response times are too much when the response is to a keystroke made while typing a letter.

What Sun claimed was the Next Big Thing was actually a very old, and very bad idea dressed up in new clothes. What Sun was betting on was that managers, who really did have the maintenance problems depicted in the nightmarish publicity, would be so impressed by the words 'Next Big Thing'

on the packaging that they wouldn't look at the product until they'd spent all their money. It's worked before for other computer companies, and it's been working in other industries for years.

In fact, Thin Clients didn't really take off, and (as far as I can tell, because such policies are rarely covered in press releases) the Next Big Idea is being allowed to slide gently into the oblivion it deserves. I guess, one sucker being born every minute is not sufficient to dilute the explosively-growing pool of computer repairers, who are either smart enough to spot a solution in search of a problem or else can spot an idea that (it claims) will put them out of work en masse.

Sun's other problem was that it pitched to the wrong market. They are claiming that a bag of their technologies will invent away a whole industry - that of mending computers. The industry has no intention of being invented away - there's loads of good livelihoods in it. Also, while the idea of mainframes might not be new, the proposal to throw away all your PCs and revert to Sun's version of the Stone Age is pretty radical. As a bunch, IT managers are far from radical.

So, Thin Clients was an out of date idea targeted at the very group who wanted it least. It's hardly surprising it didn't work. What amazes me is that anyone took it seriously at the time. ■

*Jules is a programmer, writer and hardware designer. You can call him on 01707 662698 or email [mayhem@jules.cix.co.uk](mailto:mayhem@jules.cix.co.uk).*







## A COOL range?

Dear Sir,

I have been using Sterling's Cool:Plex development tool for about 18 months now (having previously used Cool:2E for several years before).

The part of Ian Murphy's article (*A Sterling range*, EXE, January 2000) regarding Cool:Plex struck me as being very superficial.

He fails to point out that the client will only run in a Windows environment as it is heavily dependent upon API calls. Client functions can only be generated in Visual C++ or Visual J++ (pure Java can only be generated for server functions). There is no Unix/Linux support.

The development environment is totally unlike most other products. The screen design tool is archaic and not what people have come to expect from a Windows tool.

Understanding what is going on in a Cool:Plex program can be very difficult. There at least three interlinked ways of defining or programming a function (triples, pseudo code and meta code, not to mention the complexities of multiple inheritance) and it is not possible to see the effects of all of them at the same time so debugging is a nightmare. Of course, there is a whole new vocabulary of jargon to learn – a lot of which is borrowed from other creeds and used to mean something totally different.

There are a large number of companies out there which use Cool:2E (formerly Synon/2E), a code generating tool for AS400. One of the main selling points of Cool:Plex is that Cool:2E projects can be migrated to the new environment and *voilà!* you have a Windows client/server



**We welcome short letters on any subject relevant to software development. Please write to: The Editor, EXE Magazine, St. Giles House, 50 Poland Street, London W1V 4AX, or email [editorial@exe.co.uk](mailto:editorial@exe.co.uk). Letters may be edited.**

application capable of being generated to run on several platforms. This is not really true. The migration from procedural to event-driven processing is not an easy one and most companies have used Sterling's consultants to help or do it for them.

There are few major developments around the world that use this tool. Many that have tried it have failed. The learning curve is very, very steep and even the ex-Sterling professionals that I work with cannot anywhere near match the productivity that other tools provide.

Sterling's website is the only place you will find any evidence that there are other Cool:Plex users out there (unlike the hundreds of VB/Delphi/etc sites). I did find one other site but it has not been maintained for years and had little of interest.

From this you may glean that I am not a fan of Cool:Plex, but that aside I think it would have been useful if Ian Murphy had done a little more research. In my opinion Cool:Plex is a nice idea very badly implemented.  
*Roger Miall*  
[RogerMiall@freenet.co.uk](mailto:RogerMiall@freenet.co.uk)

## Software rental

Dear Sir,

I was very interested to read the *Mayhem* on software rental in the Dember 1999 issue. The day after reading it I got a letter from Interleaf. We have been using Interleaf for our end-user manuals for nearly 8 years now, progressing through versions 4, 5, 6 and 7, always paying software maintenance.

The letter informed us that Interleaf has released a new product called Quicksilver, which appears to be Interleaf 7 with the ability to publish as XML. It looks good on paper, but that's not the point...

They've also announced that Quicksilver will only be available on software leasing, no licences in perpetuity. All ongoing development of previous products has stopped, there will never be any new versions of them, although we can continue buying software maintenance at 10% discount(!) for bug fixes.

So we're caught between the devil and the deep blue sea, we either lose ownership of 8 years of documentation development or we stick to using outdated tools. What a shoddy way these people treat their customers.

If anyone has experience of porting large Interleaf documentation products to any other packages we'd be very interested to hear:

*Richard Jackson*  
Technical Manager  
Radiometrie Limited

**Interleaf replies:** The majority of our 2 million customers use our product to generate content critical to their organisations. In response to the demand to move from paper to the Web, we recently released Quicksilver, a high-end XML Authoring tool that is fully compatible with Interleaf 7 and our new very successful BladeRunner XML content management suite.

Unlike our competitors, who normally charge an additional licence fee for this type of layered application, we choose to offer this free of charge to our loyal customers. The offer is to convert to a subscription contract for no extra cost. This provides for

the new Quicksilver licence as well as continued support on existing perpetual licences. As is standard practice in the software industry we also announced that previous versions will no longer be supported next year.

We feel this is a very generous proposition and in the US over 90% of our customers have taken this up.  
*Jeremy Sindall, VP Europe Interleaf*

## Stob is a snob

Dear Sir,

I would just like to point out what a total waste of space the January *Stob* was (*13 ways to loathe VB*). Are her comments 'for real' or is she just having a C++ Snob's pop at a language she is clearly not qualified to comment on.

[Mr Daymond points out that VB supports 32-bit longs as well as 16-bit integers, and that Ms Stob's difficulty with checkboxes is caused by their default property having integer type - Ed]

Apologies if I sound sarcastic, but languages should be looked at objectively for the job they are intended. For sure C++ etc can do things that VB can not, but there are also a lot of times when VB can do the job many times faster.  
*Paul Daymond*  
VB Development Manager  
Infrasoft Limited

Dear Sir,

[January's *Stob* was] really weak. Read help and stop writing 'argh it sucks because I don't know how to use it' articles.

*Urmo Rae*  
[urmo@mindworks.ee](mailto:urmo@mindworks.ee)

We've had a lot of heartfelt email about this item. Despite Messrs Daymond & Rae, Stob apologists outnumber detractors about 3:1 – Ed.

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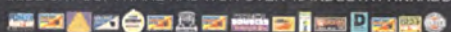
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# Windows 2000 is served

**Windows 2000 has finally made the transition from a beta product into Microsoft's premier operating system. Jon Perkins has had a look at the finished version...**

DAVID LEITH

And so Microsoft has finally completed its biggest ever undertaking and Windows 2000 (W2K) is now its flagship operating platform. The result is another massive training exercise for the worldwide community of developers who will target this platform, and the prospect of a whole host of product upgrades to go along with it. For this article I have removed my Visual Basic hat and will be discussing some of the wider issues that are relevant to all developers. I'd like to start by reviewing some of the general features of

the W2K product set. I'll then move on to have a closer look at a few of the most important technologies and concepts you should consider before working with this architecture.

From the day that Windows 95 emerged it has been a battle for Windows NT to keep up in two key areas. While NT has always been a more robust and, arguably, enterprise-oriented operating system it has lacked features that its lower-ended sibling has had from day one. In 1995 Microsoft found itself in the uncomfortable



position of having the more powerful desktop shell available only on its low-end operating system, whereas the old Program Manager shell still sat on its high-end, premier operating system, Windows NT 3.51. A year later, Windows NT 4 (known at the time as the Shell Update Release) was made available and the most obvious shortcoming had been overcome. The second most serious shortcoming, plug and play, has only now been overcome after another four years of development.

#### W2K family

W2K will ship in four different versions:

**Professional:** The standard desktop edition for users, which supports up to two processors and 4 GB of memory.

**Server:** The basic server edition, which supports four processors and 4 GB of memory. It provides file, print, intranet and networking services.

**Advanced Server:** As the Server edition, but it supports 8 processors and 8 GB of memory. It also offers two-node failover and 32-node network load balancing.

**Data Center Server:** Delivery date is still to be announced at the time of writing. As per Advanced Server edition, but it will support up to 32 processors and 64 GB of memory. It also offers a cascading failover among four nodes. This is Microsoft's high-end product for enterprise servers that need to support intensive online transaction processing (OLTP) services.

#### Key features

W2K introduces so many new features that it's difficult to know which to include in an introductory article. However, the key features as I see them are:

**Installation:** Windows finally understands the FAT32 partitioning scheme introduced by Windows 95 SR2. The good news here is that you can make up a boot disk from Windows 95 SR2 or Windows 98 and format the hard disk on your target machine to be greater than 2 GB. Previous versions of Windows NT would have refused to install onto such a partition and so boot partitions were generally confined to being 2 GB in size. Therefore, if you've got a machine with a single 9 GB disk, then you can also have a single 9 GB C: drive if you want. However, it really is a good idea to have your boot partition separate from your data. Service pack 4 of Windows NT 4 was notorious for failing halfway through the update of the core system files, leaving an unbootable machine. I know of people who kept application data on their boot partition (under NTFS) that fell foul of this and lost it. Either way, the choice is there now.

When you install the server edition there is only so much that you can do from the installation dialogs, although this isn't immediately obvious. For instance, under NT4 you could specify that a server would be a domain controller. With W2K you must complete the basic installation of the operating system. Only after your first proper local login are you presented with a wizard application that allows you to set up additional components and services. In the case of the domain controller example, this is really dependent upon Active Directory services being installed after which you can specify the kind of role that the server will take in the network.

Related to the theme of installation is that of service packs, an area of previous criticism that Microsoft has also addressed in this release. Despite the level of service packs available for NT 4 reaching 6a, the generally available install disk only included the service pack 1 level fixes. Once this had been installed it was then

necessary to subsequently apply the latest service pack, making the whole operation take longer. Now, thanks to a process known as service pack slipstreaming, it will be possible to create a new W2K installation kit that contains both the latest service pack and any subsequent hot fixes that might be available.

**Disk/filesystem:** NTFS has been the subject of much improvement. The concept of disk partitions is being replaced with a new concept called *dynamic volumes*. As the name implies, this is an operation whereby a raw area of physical disk can be added to an existing volume dynamically (ie without the need for a reboot). W2K will continue to support partition-based disks, but as of now they are considered to be legacy configurations. Under the previous disk partitioning mechanism it was possible to have up to 4 partitions residing within a single physical disk, but now this option is completely configurable.

For notebook users, a very useful new feature is the local caching of network data. This is a significant improvement to the My Briefcase concept in the way that copies of network files can be stored locally for you to use on the move. To make it work you right-click on a network file or folder within the Windows Explorer and select the Make Available Offline option. The neat thing about this is that files and folders still appear to be in the same place, ie on the network. For example, if your F: drive is a network resource, then you would still see the F: drive when you are unplugged from the network, and you will be able to see and work with any files that you had previously marked to be available. Then, when you reconnect to the network, an automatic synchronisation takes place, although quite correctly you are asked to decide how you want to play it if both the offline and online copies have each been updated since the previous synchronisation.

**Windows File Protection:** Microsoft has become much more protective of the core system files that make up Windows. System files are now marked as 'super-hidden' and efforts are made to stop you tampering with them. For example, if you click on the *Winnt* folder within the Windows Explorer, then no files are initially displayed and you are presented with a rather blunt message:

This folder contains files that keep your system working properly. There is no need to modify its contents.

There are also safeguards in place to prevent you from accidentally deleting core files – Microsoft claims that you could delete all the files on your hard disk and the machine would still boot, but I

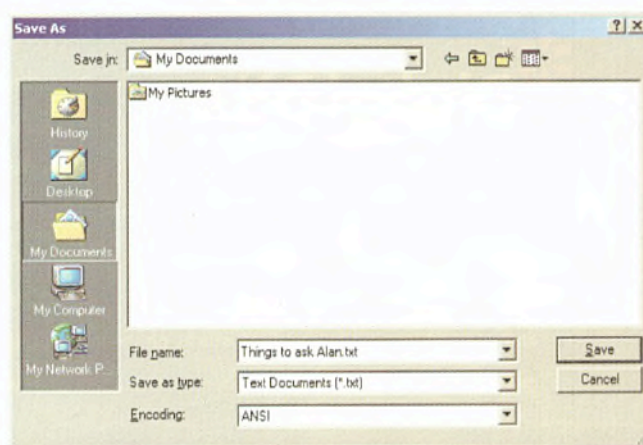


Figure 1 – Redesigned common dialog.



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strongly suggest that you don't try this at home. Windows is also very concerned about certain files being overwritten; Microsoft has identified around 2,600 files that are crucial to the smooth running of the full package and refers to them as *Windows Protected Files*. A background task called the *System File Protection* service checks whether any of the protected files have been replaced and, if so, takes steps to restore the original.

**Server features:** When the Windows NT Option Pack was made available for free a member of the Microsoft UK team expressed the opinion that this new bundle of software really should have pushed up the name of the underlying operating system to Windows NT 4.5. I think he had a point. The key components of the Option Pack were Microsoft Transaction Server (MTS), Internet Information Server (IIS), Certificate Server and Message Queue Server (MSMQ). Now all of these features are available as an integral part of the W2K Server family, with some aspects included in W2K Professional too.

IIS 5.0 continues its rather rapid evolution. This time ease of administration was an obvious point of focus for the development team. There are new wizards that are specifically targeted towards the more difficult tasks, most notably for the creation of certificates. Also new is HTTP compression, which as the name suggests reduces the size of textual data being sent down the line. In order for this to work, the receiving browser must be able to handle a compressed HTTP stream (IE4 and IE5 can, as can Netscape Navigator 4). The downside is that it does add slightly to the load on the processor, but as the main bottleneck is usually the speed of the data connection it is likely to be beneficial on many newer machines.

**Windows Driver Model:** As part of the continuing drive to converge the NT platform and the Windows 98 family, the Windows Driver Model (WDM) has been adopted to ease the load on the poor device driver writers (see *WDM – a better class of device driver*, EXE, January 1999). W2K and Windows 98 use the same drivers to control hardware, thereby reducing the burden on hardware manufacturers.

To make things easier still, Microsoft has redesigned the overall model. Previously each driver had to be written from scratch, although templates were made available within the DDK to get things started. In W2K, Microsoft has split the concept of a device into two halves. One half provides the general functionality that the *class* of driver provides, such as an audio class that covers sound cards. Microsoft has written class drivers that provide the high-level features common to the devices in question. It is then up to the hardware manufacturer to write a minidriver that provides the specific functionality that addresses the needs of its own equipment.

Driver developers will be pleased to learn that the new sample DDK code – from which starting point many drivers do get written – is finally a realistic representation of how a professionally written driver should be coded.

**Power management:** W2K incorporates a power management facility that features several levels of shutdown, from simple screen blanking and hard-drive spindown to complete hibernation. This concept was originally introduced with Windows 95 as Advanced Power Management (APM) but now the Advanced Configuration and Power Interface (ACPI) specification has superseded it. W2K supports both the obsolete APM and ACPI. The latter is part of an initiative called OnNow which, according to Microsoft, 'defines a hardware-level interface that enables operating systems



**MS claims you could delete all the files on your hard disk and the machine would still boot. Don't try this at home!**

to implement power management in a consistent, hardware platform-independent way'.

W2K provides power management via, errm, the Power Manager, a new kernel-mode subsystem. In order for this to work the motherboard must have a BIOS that supports ACPI. Applications, too, must support this feature in terms of cleaning up, closing files and saving state data.

When the Power Manager wants to enter suspend mode, it signals its intention by sending all applications a WM\_POWERBROADCAST message. At this point, applications may vote for or against suspension. If all the applications approve, then a second WM\_POWERBROADCAST message is despatched indicating that the suspend operation is actually about to happen – this is the time to save your data and your state. Finally, when the PC wakes up again, another WM\_POWERBROADCAST message is sent and each application should be able to recover itself to a stable operational state.

**Plug and play:** This is one of the most eagerly awaited features. The Plug and Play Manager subsystem will automatically identify any devices that 'appear' (ie are plugged in) as long as they conform to the ACPI specification. Windows keeps the more common device drivers on hand and will automatically install them if it can, otherwise it will prompt the user to make one available. As a new device is added, a sub-component of the Plug and Play Manager (called the Arbiter) dynamically re-assigns hardware resources between the new and existing devices in order that they can coexist successfully.

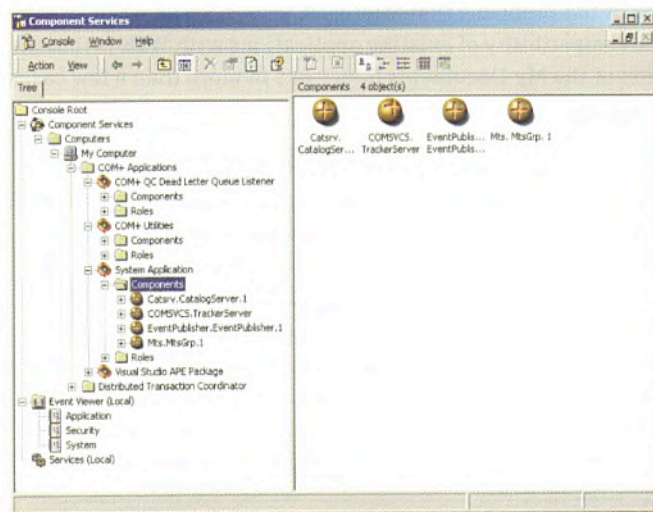


Figure 2 – Component Services MMC snap-in.





**Also new at the kernel level is the Job object, which is a programming feature that creates a relationship between multiple NT processes.**

#### W2K Application Specification

Since Windows 3.1, Microsoft has provided guidelines for the development of Windows applications in order to provide both a consistent experience for the end user and to promote harmony between each application and the underlying operating environment. Originally called the Designed for Windows logo programme, it has now evolved into the W2K Application Specification. Two levels of conformance exist: one for W2K Professional and the other for the W2K Server range.

The core specification is really aimed at ensuring that an application doesn't use any outdated features that were found in earlier versions of Windows. The application must be 32-bit, must support long filenames and UNC paths and it must ensure that all data file extensions have associated file types, descriptions and actions.

Installation requirements have been updated somewhat in that Windows installer-based packages must be provided (see my Visual Basic column from January 2000 for more on this). It is also important that the product should correctly support uninstallation. The uninstall mechanism should be accessed via the Add/Remove Programs icon within Control Panel, rather than as a shortcut in the Start menu.

On this subject, Microsoft has become more strict in declaring what should and shouldn't be visible from the Start menu. It is now recommended that shortcuts to help files and readme documents also be excluded to avoid cluttering up the whole Start menu area.

One of the problems that Microsoft testers found while assessing the compatibility of existing applications with W2K is that the location of the My Documents folder has in more than a few cases

been hard-coded. In W2K the location of this folder has been moved to `C:\Documents and Settings\<username>\My Documents`, so of course the full path cannot be hard coded because it will alter for each user. Defaulting to each user's My Documents folder for the storage of user-created data is an Application Specification requirement, but the means by which it is achieved apparently needs better publicising to the development community. For the record, the way to do this is to make a call to `SHGetFolderPath` and specify `CSIDL_PERSONAL` as the folder type. Of course, you should use the common dialogs whenever you can, and these now include the relevant My Documents location for the current user (see Figure 1).

The Application Specification also includes requirements for the OnNow/ACPI support and Active Directory. There are also some specific requirements for the server editions of W2K; most notably, anything that has a need to be managed must be done so via a Microsoft Management Console (MMC) snap-in (see Figure 2).

#### Kernel changes

You might have noticed from the descriptions of the four editions of W2K that the 4 GB process space limit has now been exceeded on the two higher-end versions. Under Windows NT 4 the 4 GB limit was determined by the 32-bit addressing scheme used on the Intel architecture, but the more recent x86 chips include a feature known as Physical Address Extension (PAE) that uses a 36-bit physical addressing scheme and thereby allows up to 64 GB of physical memory to be addressed. To accommodate this, W2K includes a new API (with all four editions of the product) called the Address Windowing Extensions (AWE). The API consists of just four functions: `VirtualAlloc`, `AllocateUserPhysicalPages`, `MapUserPhysicalPages` and `FreeUserPhysicalPages`.

Also new at the kernel level is the *Job* object, which is a programming feature that creates a relationship between multiple NT processes. Sometimes it is desirable for a program to spawn a whole new process in order to perform a task. For example, Visual C++ runs within the context of a Microsoft Developer Studio application, which is a single Win32 process. However, the main compilation routine is performed by a separate executable called `cl.exe`, which in turns spawns child processes (eg `cl2.exe`). If it becomes necessary for the logical task of compilation to be halted, it was previously very difficult to implement a means of killing all of the processes together because no explicit relationship between them existed. In W2K, a process can create a Job object using the `CreateJobObject` function and then subsequent processes can be added by calls to `AssignProcessToJobObject`. If the need should arise to kill all of the added processes together, then a simple call to `TerminateJobObject` will do the deed. Job objects can be named and shared, and they can also be used to manipulate common attributes of all member processes.

#### Active Directory

What's the most important improvement within W2K? It depends who you ask. An ordinary user would probably argue the case for Plug and Play, but for anybody who supports Windows NT-based networks the answer must be Active Directory.

The problem is that the domain model used in previous versions of Windows NT isn't suited to the size of enterprise networks that exist today. This has been bad news for Microsoft since it has undoubtedly lost corporate sales to the likes of Novell because of this. NT 4 domains comprise a Primary Domain Controller (PDC),

COM+ facility	Previously existed within MTS 2.0
Automatic thread pooling	Yes
Automatic database connection pooling	Yes
Automatic transaction enlistment	Yes
Declarative security	Yes
Shared property manager	Yes
Object request brokering (ORB)	Yes
Queued components	No
Loosely-coupled events	No
Object pooling	No
Object construction	No
Compensating resource managers (CRM)	No

Table 1 – New features within COM+.



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**Every object that exists within an Active Directory namespace has a distinguished name (DN). The DN is based upon a hierarchical path through the namespace.**

probably a Backup Domain Controller (BDC) and client workstations. If you have multiple domains, then it is necessary to set up all kinds of fiddly trust relationships between them.

Active Directory (AD) still uses domains, but the concept of a primary domain has been replaced with a more enterprise-friendly hierarchical model. The directory service is concerned with maintaining a database of all the objects that exist within the network, but within the structure of a secure and partitioned namespace. Objects can be anything, such as users, computers, printers, applications and so on.

In terms of the overall hierarchy, objects exist within namespaces – that is, a bounded area within which a given name can be resolved. The objects here exist hierarchically. For example, individual user objects exist within a collection object (called a *container* in AD). This namespace of hierarchical objects is called a *tree*. On a larger scale a collection of trees can exist as a *forest*. Objects in a forest do not share the same namespace but they do fall under a common schema. This schema contains the rules and definitions that specify the content of, and relationships between, a set of objects within a directory service.

Every object that exists within an Active Directory namespace has a *distinguished name* (DN). The name of the DN is based upon a hierarchical path through the namespace. For example, if my website was an Active Directory hierarchy that existed on the Internet (it's not, before you try), then my DN could be:

```
/O=Internet/DC=COM/DC=jonperkins/CN=Users/CN=Jon
```

This DN identifies the user object Jon as existing within the *jonperkins.com* domain.

The software developer manipulates Active Directory using the Active Directory Service Interface (ADSI). Programmatically, for those of us who connect via COM Automation interfaces, this means setting a reference to the Active DS Type Library. With Visual Basic, for instance, I could set the value of my home page property within the Jon object as follows:

```
Dim oUser As IADsUser
Set oUser = _
    GetObject("LDAP://O=Internet/DC=Com" + _
        "/DC=jonperkins/CN=Users/CN=Jon")

oUser.HomePage = _
    "http://www.jonperkins.com/index.htm"
oUser.SetInfo
Set oUser = Nothing
```

#### COM+ and DNA 2000

DNA 2000 is Microsoft's platform for supporting multi-tiered applications (the letters stand for Distributed interNet Architecture). It is really a collection of technologies that all provide the services necessary to host applications that conform to the data/business/presentation services model.

At the heart of DNA is COM+ Services 1.0, formerly known as Microsoft Transaction Server (MTS) but now fully integrated into the operating system rather than an add-on provided by an option pack. COM+ isn't just a renaming of MTS 2.0, however. It adds new features such as distributed transaction support, role-based security management and thread synchronisation. It also incorporates the message queuing services previously available in Microsoft Message Queue Server (MSMQ). The administration of COM+ components can now be found under the Component Services icon within the Administration Tools folder (which has been sensibly moved from the Start menu to the Control Panel). Figure 2 shows an illustration of the Component Services folder and Table 1 shows the new features within the COM+ Services. I intend to provide a more thorough coverage of the creation of COM+ components in a forthcoming Visual Basic column.

DNA 2000 is the overall architecture that provides a suitable environment for Web applications. Actually, that's the Microsoft definition. In fact, it is just as suitable for conventional EXE-based front ends as it is for browser-based applications. W2K doesn't provide the final piece of jigsaw for the great DNA 2000 plan though. While you can build proper DNA 2000 applications today with W2K there are still some products yet to appear that will complete the picture. In my Visual Basic column this month I introduce XML, a new standard for the transfer of both data and the definition of that data. XML is very important to DNA 2000 and to this end a new version of SQL Server will provide a high-degree of support for it. Similarly a new product called Microsoft BizTalk Server will provide business process integration within the enterprise through the exchange of XML-formatted business documents. Finally, Microsoft AppCenter will simplify the deployment and management of Windows DNA applications within 'farms' of servers.

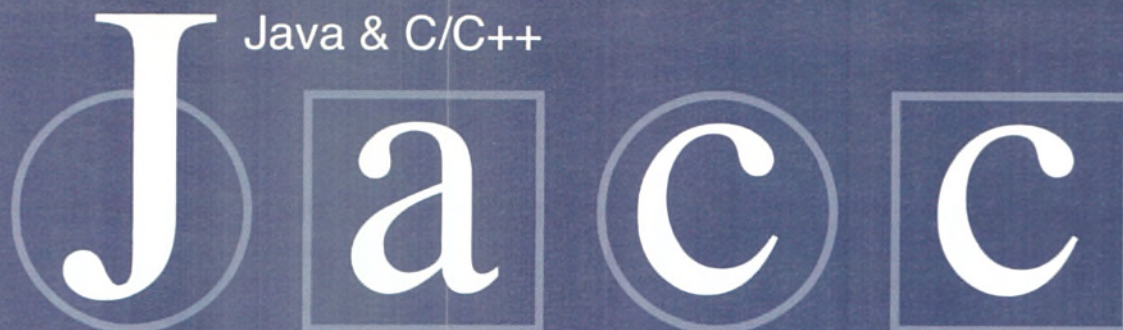
#### Last word

Microsoft has dedicated a huge amount of effort into producing an operating system that offers so much. At last its high-end operating system includes all the important features of its lower-end offering. Just as important, it has finally started to deliver a platform that scales from notebook all the way up to corporate server. We really have had to wait a long time for this upgrade, but I think it was worth it – not that we had any choice. I don't doubt that many companies will want to wait until the first service pack has been in circulation for a while. However, Microsoft is undoubtedly impatient for a rapid uptake so I expect to see this psychologically important milestone reached within the next six months.

Having finally produced a code base that doesn't have the gaping holes of its predecessor I would envisage that future versions will not be so difficult to get out of the stable. And so, having overcome its greatest technical challenge to date, we now have to wait and see if Microsoft can have a similar success with its greatest legal challenge too! ■

*Jon Perkins is a freelance Visual Basic and SQL Server developer, and is a Microsoft Certified Solution Developer. He has been developing for the Windows platform for ten years. Contact him at [www.jonperkins.com](http://www.jonperkins.com).*





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# Ending with the grin

In October's EXE, Francis Glassborow introduced the classic C++ idiom 'Cheshire Cat'.

Alan Griffiths examines this technique in more depth and applies some recent ideas.

The compilation model of C++ (and to a lesser extent of C) leads to a number of related problems that we can group under the heading of 'compile-time dependencies'. Later in the article, solving these problems will lead us to the 'Cheshire Cat' idiom. But first, let's review the dependency problems to be addressed.

In a typical C++ project there are two significant categories of source files: implementation files and header files. Each time an implementation file is compiled, the compiler's pre-processor combines the implementation file with one or more header files into a 'translation unit' on the basis of embedded `#include` directives. Because of this mechanism there is often much more code seen by the compiler in a translation unit than is seen by the human eye in the corresponding implementation file.

In small projects – of the size set as course work, or used as examples in books – this doesn't cause any apparent problems. But many C++ developments are large enough for it to become an issue.

I once consulted on a project where header files included other header files to such an extent that almost every translation unit included all of the header files (most of them more than once). Each header included up to a dozen others, these in turn included a dozen others and so on in an apparently exponential explosion (fortunately, there were only a finite number of headers that could possibly be included or compilations would never have finished). This had the effect that over one hundred thousand extra lines of text were processed for each compilation and that several hundred implementation files needed recompilation whenever any header changed. (In case you hadn't guessed, this project was in trouble and delivered late.)

Why did each of these header files include so many other files? In essence it is simply so that the class definitions in them could be compiled. Definitions are needed for classes that are used in the header file. But, in addition to classes used in the public interface, each class made use of a number of other classes in its body and a few key classes among these were both used by and made use of a large number of the other classes in the system.

Let me summarise the problems seen here:

1. Translation units include code that isn't needed by the code in the implementation file. This forces the implementation file to be recompiled in circumstances that do not affect the code in it. Furthermore, it exposes unwanted APIs. In particular, headers that define macros can be problematic. (Especially if the macros have poorly chosen names like `begin` or `RegisterClass`. In C/C++, macro names should be ALL\_UPPERCASE.)
2. Any non-trivial change to the implementation of a class caused a modification to the definition in the header file. This makes it necessary to recompile every translation unit that includes

the header. Consequently, it becomes impossible to distribute updates to object code libraries (whether static or dynamically linked) without requiring the client code to be recompiled.

3. Sometimes it is desirable to conceal the implementation techniques: either to prevent abuse (code that depends on details that are not part of the documented interface) or to protect intellectual property.

## Traditional C solution

Since the C++ compilation model is inherited from C let us take a quick look at the 'traditional' C solution (pointers to incomplete types). We'll be taking as our example the header file defining a simplified 'telephone list' API.

```
struct phone_list_implementation;
typedef struct phone_list_implementation
    *phone_list;
```

```
phone_list pl_create(const char *name);
void pl_destroy(phone_list pl);
const char *pl_list_name(phone_list pl);
const char *pl_find_number(phone_list pl,
    const char *person);
void pl_add(phone_list pl, const char *name,
    const char *number);
```

Note that the client code never sees a definition of `struct phone_list_implementation`. This doesn't matter – the client code can use a `phone_list` without any knowledge of how it is implemented – it is simply passed as a parameter to any function (such as `pl_find_number`) that uses it.

The C header file is nicely self-contained: it doesn't use any `#include` directive. This solution was well established when I started working with C in the mid-80s. This code is also valid C++, but fails to make effective use of C++ language features.

## The 'classical' Cheshire Cat

The 'Cheshire Cat' idiom first emerged in the late 80s and was described in the documentation of a cross-platform GUI class library called `CommonView`. The developers of `CommonView` were influenced by all three of the above reasons for hiding the implementation. They were competent developers and either knew of the above solution or independently developed something very similar for themselves.

The sort of implementation that would have been found in the `CommonView` library is as follows:

```
struct phone_list_implementation;
class phone_list
```



```

{
public:
    phone_list(const char *name);
    ~phone_list();
    const char* list_name();
    const char* find_number(const char *person);
    void add(const char *name, const char *number);

private:
    phone_list(const phone_list&);
    phone_list& operator=(const phone_list&);

    phone_list_implementation* grin;
};

```

The approach taken here may look different from the C example but the differences are on the surface. If you mentally add the implied `this` parameter, the similarities become apparent: `create` has become a constructor, `destroy` has become a destructor and other functions are essentially unchanged.

I've added a private copy constructor and assignment operator because a `phone_list` owns the `phone_list_implementation` to which it holds a pointer – the default behaviour would clearly be inappropriate.

#### Textbook C++ implementation

A number of features of the above class cause it to look rather dated; all the types are declared at global scope, raw `char*` point-

ers are used and the `add` method returns a useless `void`. As with the original C code, this is still legal C++ but it is not the way that C++ is written today.

For a moment let us forget the 'Cheshire Cat' and consider the sort of implementation that you'd often see as an example in a modern textbook (and in the project mentioned before).

```

#include <string>
#include <utility>
#include <map>

namespace office_utilities
{
    class phone_list
    {
    public:
        explicit phone_list(std::string name);
        ~phone_list();
        std::string name() const;
        std::pair<bool, std::string>
            number(std::string person) const;
        phone_list& add(std::string name,
            std::string number);

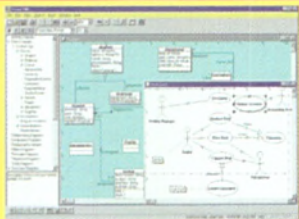
        phone_list(const phone_list& rhs);
        phone_list& operator=(const phone_list& rhs);
    };
}

```

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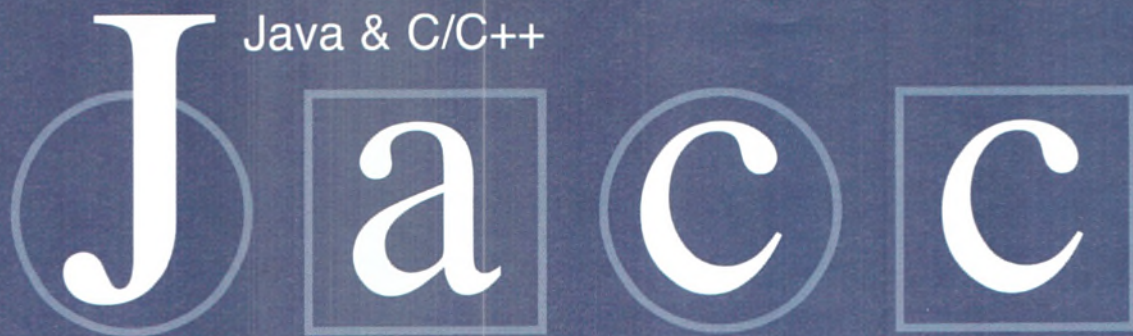
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## An alternative to Cheshire Cat

C++ offers an alternative design approach to the Cheshire Cat idiom based on a class whose interface comprises only pure virtual methods. This idea will be familiar to Java programmers as an *interface*. The following example code illustrates this approach.

The derived class that implements these methods is not made accessible to client code. The correspondence to the canonical 'Cheshire Cat' form presented in the main text should be clear.

```
// Header
#include <string>
#include <utility>
namespace office_utilities
{
    class phone_list
    {
    public:
        static phone_list* create(std::string name);
        virtual ~phone_list() = 0;
        virtual std::string name() const = 0;
        virtual std::pair<bool, std::string> number(std::string person) const = 0;
        virtual phone_list& add(std::string name, std::string number) = 0;
    protected:
        phone_list() {}
        phone_list(const phone_list& rhs) {}
    private:
        phone_list& operator=(const phone_list& rhs);
    };
}

// Implementation
#include <map>
using office_utilities::phone_list;
using std::string;
using std::pair;

namespace
{
    class implementation : public office_utilities::phone_list
    {
    public:
        implementation(std::string initialName);
        virtual ~implementation();
        virtual string name() const;
        virtual pair<bool, string> number(string person) const;
        virtual phone_list& add(string name, string number);
    private:
        typedef map<string, string> dictionary;

        string list_name;
        dictionary dict;
    };
}

namespace office_utilities
{
    phone_list* phone_list::create(string name)
    {
        return new implementation(name);
    }
    inline phone_list::~~phone_list() {}
}

implementation::implementation(string initialName)
: phone_list(), list_name(initialName)
{}

implementation::~~implementation()
{}

string implementation::name() const
{
    return list_name;
}

pair<bool, string> implementation::number(string person) const
{
    dictionary::const_iterator i = dict.find(person);
    return (i != dict.end()) ?
        make_pair(true, (*i).second) :
        make_pair(false, string());
}

phone_list& implementation::add(string name, string number)
{
    dict[name] = number;
    return *this;
}
```

With this approach the client code works with a pointer to the `phone_list` not with a value (as is the case with Cheshire Cat). This makes it suitable for classes that adopt 'reference-based' semantics whereas Cheshire Cat is suitable for classes with 'value-based' semantics.



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```
private:
    typedef std::map<std::string,
        std::string> dictionary;

    std::string list_name;
    dictionary dict;
};
}
```

That's more modern: using `std::string` instead of `const char*`, combining a result with a status flag by using `std::pair<>` and so on. We've also gained three `#include` directives and have no secret implementation structures. These particular headers are relatively benign: certainly any code that makes use of `phone_list` is going to need `<string>` and `<utility>` as `std::string` and `std::pair<>` are used in the class interface. However, even in this small example the fact that the class uses `std::map` is a detail that could be hidden from the code using it.

Consider the effect if I were to improve this implementation by using a name comparison method that ignored case and understood that 'Mc...' was equivalent to 'Mac...'. First, I'd need to make the comparison method visible in this header file, second every user of this class would have to recompile their code and third everyone could see how I'd done it. Not ideal.

### In modern C++

If we combine the best points of the last two examples, we will end up with the canonical implementation of a 'Cheshire Cat' class in modern C++:

```
#include <string>
#include <utility>
namespace office_utilities
{
    class phone_list
    {
    public:
        explicit phone_list(std::string name);
        phone_list(const phone_list& rhs);
        ~phone_list();
        std::string name() const;
        std::pair<bool, std::string>
            number(std::string person) const;
        phone_list& add(std::string name,
            std::string number);
        phone_list& operator=(const phone_list& rhs);

    private:
        class implementation;
        implementation* grin;
    };
}
```

The complete implementation of this version of the class is shown in Listing 1.

Since the client code never sees a definition of `implementation` I am free to rewrite it and the header doesn't change and client code is unaffected. On most (all?) implementations of C++ even a new version of this class with new methods added to the interface will remain link-compatible with existing code, even if these methods require changes to the implementation. (A hypothetical imple-

mentation where adding methods to a class breaks link compatibility would be valid, but in practice this is not a problem with non-virtual methods.)

These advantages are gained at the cost of writing an extra class (in terms of code written, the `phone_list` is the extra class) containing a few forwarding functions and a few functions to manage the implementation. (There is another important way of translating this class, see *An alternative to Cheshire Cat*.)

### Still in need of modernisation?

Once you've written a few classes using this idiom it will occur to you that you are writing the same functions again and again to manage the implementation. Specifically, the copy constructor, assignment operator and destructor of a Cheshire Cat class are generic – they always look the same, they differ only in the types of the interface and implementation classes.

Every developer knows that problems occur not so much in the 'difficult to write' code, but either in code that one writes before thinking through what it should really do, or in code that is so routine that the brain seems to leave the body on auto-pilot to visit another world.

C++ has a tool to address the sort of generic programming represented by these functions: templates. If we can find a way to use templates to avoid writing these boring functions repeatedly, then we can avoid a source of silly errors. What are we looking for? A template that looks after an object allocated on the heap and ensures it is copied and deleted when appropriate. This sounds like a 'smart pointer'.

If we replace `implementation*` with `std::auto_ptr<implementation>` in the `phone_list` class, we find that we still need to write the copy constructor and assignment operator. (To avoid an implementation being passed from one `phone_list` to another.) Fortunately, the compiler detects the non-standard copy and assignment of the `auto_ptr<>` data member and issues a diagnostic to prompt us to write these functions.

A subtler problem with `auto_ptr<>` is that we also need to write the destructor and to implement it in the 'implementation file'. If we don't, the compiler silently generates one for us. In doing this it instantiates the `auto_ptr<implementation>` destructor without having first seen the definition for the implementation. This leads to 'undefined behaviour'. (A good compiler may give a warning about deleting an incomplete type, but the language standard requires that the code compiles – although the results are unlikely to be what the programmer intended.) For another look at `auto_ptr<>` see *The safe path to C++ exceptions*, EXE, December 1999. Rewriting the code using `auto_ptr<>` would save us nothing, so I won't bother to show the code.

Although the standard library doesn't supply a 'smart pointer' for our needs it is possible to write one. I've put one into the 'arglib' library on my website (see below). This allows the `phone_list` class to be rewritten as follows:

```
class phone_list
{
public:
    explicit phone_list(std::string name);
    std::string name() const;
    std::pair<bool, std::string>
        number(std::string person) const;
    phone_list& add(std::string name,
```



```

        std::string number);
private:
    class implementation;
    arg::grin_ptr<implementation> grin;
};

```

Note that there is no longer a need to supply the copy constructor, assignment operator or destructor as the necessary logic is supplied by the `grin_ptr<>` template. (I've not shown the implementation file again since it differs from Listing 1 only by the removal of these methods.)

In addition to writing these methods for us, `grin_ptr<>` is what Kevlin Henney refers to as a *QualifiedSmartPointer* (see *Coping with Copying in C++*, Overload 33, ISSN 1354 3172). The effect of this is that methods on `phone_list` and `implementation` may be overloaded on `const` since dereferencing a `const grin_ptr<implementation>` provides a `const implementation`. Naturally, it is rare for `const` and non-`const` methods to have the same name, but it does happen (for example, containers overload `begin()` and `end()` on `const` so as to provide `const_iterators` when the container is `const`).

Implementing the `grin_ptr<>` template presented some challenges. If you are interested in how I've addressed them, then they are described in an article on my website ([www.octopull.demon.co.uk/arglib/TheGrin.html](http://www.octopull.demon.co.uk/arglib/TheGrin.html)). Fortunately, you don't need to understand these details to use `arg::grin_ptr<>` successfully.

### Beneficial effects

I've been using 'Cheshire Cat' to good effect for over a decade (although I wrote the `grin_ptr<>` template only last year). The reason for using it does differ according to circumstance. In the troubled project mentioned before, the 'overnight' rebuild of the system

was beginning to intrude into the next day. (And, of course, because rebuilding after a change took so long the developers were becoming experts at 'solitaire' and the like.)

A combination of two techniques brought this project under control. First the implementations of several key classes were hidden away (which drastically reduced the headers pulled into clients of these classes). And second, external include guards were placed into all public header files (this saves the pre-processor re-opening the file to process the internal include guards). This exercise brought the build time down to around 4 hours, which allowed both maintenance and development branches to be built and regression tested automatically every night.

Another project, on which I'm currently working, provides a library (frequently as a DLL) to a number of other development groups, which then distribute applications to their customers. They would not be best pleased to find that corrections to the library DLL forced them to recompile and redistribute all the code that uses the library. Once again, hiding the implementation provides the answer.

The smart pointer template I present here successfully removes some of the repetitive work from the development of 'Cheshire Cat' classes. It is also flexible enough to support applications that are considerably more advanced (making use of polymorphic implementations and/or overloading on `const`) than the `phone_list` example we have considered. ■

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```

#include "office_utilities.h"
#include <map>

using office_utilities::phone_list;
using std::string;
using std::pair;

class phone_list::implementation
{
public:
    implementation(std::string initialName)
    : list_name(initialName) {}

    string name() const { return list_name; }

    pair<bool, string> number(string person) const
    {
        pair<bool, string> rval(false, string());

        dictionary::const_iterator i = dict.find(person);

        if (i != dict.end())
        {
            rval = std::make_pair(true, (*i).second);
        }

        return rval;
    }

    void add(string name, string number) {
        dict[name] = number;
    }

private:
    typedef std::map<string, string> dictionary;

    string list_name;
    dictionary dict;
};

```

```

phone_list::phone_list(string name)
: grin(new implementation(name))
{
}

phone_list::phone_list(const phone_list& rhs)
: grin(new implementation(*rhs.grin))
{
}

phone_list& phone_list::operator=(const phone_list& rhs)
{
    // Allocate...
    implementation* tmp(new implementation(*rhs.grin));

    // ...before release...
    delete grin;

    // ...and update
    grin = tmp;
    return *this;
}

phone_list::~phone_list()
{
    delete grin;
}

string phone_list::name() const
{
    return grin->name();
}

pair<bool, string> phone_list::number(string person) const
{
    return grin->number(person);
}

phone_list& phone_list::add(string name, string number)
{
    grin->add(name, number);
    return *this;
}

```

Listing 1 – The full implementation code for the canonical Cheshire Cat example shown in the main text.



# And still they come...

The huge number of different browsers – and Peter Collinson has recorded over 700 distinct types of visitor to his server – means Web designers need to think hard about the page layout.

I suppose that I've had an active Web presence of one form or another for around five or maybe six years now. I don't think there's been a time in that period when I haven't been faced with decisions about exactly which bits of the HTML protocol and other browser functions could safely be used on my pages. The decisions have generally been driven by guesswork about which program the user is employing to look at the pages.

Since it started, the underlying protocols and browser abilities on the Web have mostly been driven along by the major browser-creation companies. Standards have existed, but have moved along much more slowly than the companies felt they needed. Netscape started to push the standards process near the beginning; there was the problem about whether one could use the 'Netscape extensions' or not. This lasted for a bit, until the HTML standards body accepted most of the changes. Then Microsoft burst onto the scene dripping with Active X controls. Now the two major browsers are grudgingly compatible, but each offers different models for programming. In the middle, we have W3C (the World Wide Web Consortium) acting as the referee of the emerging standards. Of course, W3C has always had its own axes to grind. Mostly, they want to head back to the one true path: using SGML as a base standard and backing away from the non-standard markup that HTML introduced.

All this neglects other things that have become part of browser life: scripting languages like JavaScript, compiled interpretative languages like Java, image animation systems like Macromedia's offerings and other methods of transporting vision and sound.

The pace of change has slowed down somewhat in recent times and I suspect this is mostly due to the dulling of competitive aggression imposed on Microsoft because of its legal wrangles. It's a good thing, I think, that new versions of browsers are appearing less frequently than before. I don't want to restrict change, but it does seem to take a long time for new browser versions to land on people's desktops. A period of stability may mean that we end up with much less variety of browsers installed in the field, with the effect that we can actually move on to use the new features in Web pages.

## Who uses what?

What is the state of the art of browser use? Well, I've been looking at the combined statistics for my own personal and commercial sites for the last 12 (and a bit) months. Around 61% of users are using Internet Explorer of one flavour or another, 33% of users are using some Netscape version, the next in the list is interestingly WebTV at 0.5% and then comes 'the rest', each with a very small percentage share.

The rest seem to be mostly search engines and robots with the odd sprinkling of browsers like Opera or Lynx. The statistics show that even when you lump the major players together and work hard to eliminate

browser ID strings from the same search engines, there are a total of 740 distinct entities that have poked at my sites in the period. If you consider that each browser ID represents a different program and don't attempt to aggregate similar versions, then a grand total of 17,290 different programs have accessed my server in the last year. There are loads of versions of the major browsers out there in daily use. [The sceptical may refer to [www.hillside.co.uk/hillside/annual.html](http://www.hillside.co.uk/hillside/annual.html) for some more statistics – Ed.]

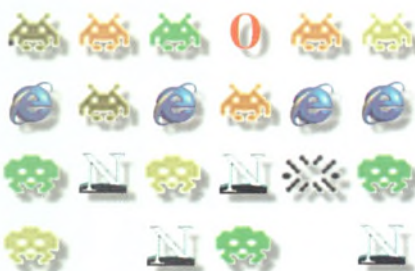
Of course, it's not clear how representative the numbers from any one site are from a statistical standpoint. Also, the percentages above were derived by comparing the number of requests against the browser name and may not give a completely true picture. After all, the comparison cannot differentiate between a 100 different users each making

one request with different browsers from one user using one browser to make 100 requests. Incidentally, I am avoiding the word 'hit'. A 'request' is a single transaction on the server – a client has asked the server to send it something. Of course, analysis of requests is fraught with the usual statistical problems that are caused by caching, both by browsers and Web caches.

However, the sample size may be significant. I am looking at a grand total of 5.8 million requests for the last 12 months, which seems a decent size. This number, and others that I am quoting, don't include any data derived from my site, which I intentionally screen out. The presence of WebTV is probably due to the happenstance that my Canterbury Tour is WebTV friendly in a Web world that is increasingly aimed at supporting PC screen formats.

Even with my qualms about doing this analysis there's mileage in looking at the level of technology represented by the people using Internet Explorer or Netscape. It seems that 14% of the requests have been made by a program that's claiming to be Internet Explorer 5 in some version. This seems significant to me. It's a good result for Microsoft given that IE 5 is relatively recent. At the other end of the technology scale, there is still some significant use of version 2 or 3 of IE; about 6% of the requests were made from one of those browsers. This is not due to timing either – looking at the output from the last three months gives the same figure. These people are missing out on the Web in a big way; this version of IE implemented only JavaScript 1.0 equivalence and so doesn't support image rollovers. Many of the effects commonly used on the Web are simply not working for these users.

What's the news for Netscape? I have a feeling that Netscape 4.7 has been out for a shorter period than IE 5.0, and the takeup is not too good, but it improves a bit if you include Netscape 4.6 in the figures: 3% of the requests came from these two browsers. Netscape 4.5 (or 4.51) seems to be the browser of choice for most Netscape users. Netscape 2 versions have some tiny use, although I would guess the numbers derive from two or three people. Netscape 3 versions are still in use, but this browser has JavaScript 1.1 so will support image rollovers.





### Designing around the problems

The number of different browsers still in use means that designers of Web pages for the Internet really need to think about what parts of the Web layout world they should use in their pages. There is considerable evidence that people don't do this, or obliviously use tools that are biased heavily in one technology direction or another. Quite a lot of sites put out Web pages that simply don't work everywhere.

My attitude with Web design is that someone has bothered to come knocking at the door of one of my sites, and I want to present them with something. I don't mind if that something isn't quite as nice as it could be because they don't have the full technology. But I don't want them to think that the page is broken because they cannot support the wonderful features that I want to use this week. If I am using some effect, then that effect must downgrade so the page is still usable.

This attitude used to make me circumspect about the use of some parts of HTML. For instance, the use of coloured backgrounds in table panels. I do now use this feature, but one still needs to think about what happens when table backgrounds are not supported. There is a danger that some browsers will not get sufficient contrast to see the information. In the worst case, think about a page with a white background, containing a table with a dark blue panel and white lettering. This would work fine on some browsers, but would result in white lettering on a white background in others.

Ensuring that the page 'degrades' gracefully means that I've never become too excited about using Java. Even now, there's a possibility that a Java applet is not accessible from the most modern browsers: the user may have turned Java off or perhaps the security policy on the user's site may have ruled out its use. Java applets fail pretty badly, leaving a hole on the screen that glares balefully at you like an empty eye socket. If that applet is providing navigation information, perhaps some form of sexy looking animated button, then suddenly that user is left with nothing to help them work the site.

My personal rule of employing technological marvels is that any goodies I use shouldn't form the major part of the site. They shouldn't supply the major parts of the information that I wish the site to display, and they shouldn't provide the navigation system on the site. Any 'new' feature that's supported by the site should be able to degrade giving the user something that represents the page. I've been attracted to JavaScript to implement many goodies, precisely because when used carefully it can allow degradation.

My JavaScript article in EXE in January 1998 (*Scripting the fall-out from browser wars*) explained two features of JavaScript that I had just begun to use at that time. The first, image rollover; I am still using on many sites to provide visual clues that buttons do something. I also use it to generate special effects, like a Millennium countdown clock formed by image replacement driven by local browser timer events. That article contained some defensive programming that checked whether the browser that was running supported image rollover and did nothing if it didn't. I notice that a lot of commercial JavaScript for image rollover doesn't contain these defences and as a result the user can be confronted with a deeply unfriendly error message from the browser.

When I made my early experiments with JavaScript I tended to add it to the page that was being sent. However, I did notice that some entries for the pages that were provided by search engines contained scrambled bits of JavaScript code. I took to supplying the main JavaScript routines as an included file. The HTML file contains something like:

```
<SCRIPT LANGUAGE="JavaScript" SRC="lib.js"></SCRIPT>
```

Actually, the SRC= construct isn't implemented in JavaScript 1.0, and so you are instantly selecting the version of the language that will support image rollovers and arrays. There is a slight complication. Further down

the page you will add something like:

```
<A HREF=...
onMouseOver="on('name') "
onMouseOut="off('name') ">...</a>
```

to call the JavaScript functions when the user's mouse wanders over the active area. If the browser doesn't support the SRC tag, then these routines will not be defined and the browser will generate an alert message complaining about missing functions. I've found that placing dummy routine definitions inside the original script caters for when the SRC tag is not recognised and that they'll be ignored when it is:

```
<SCRIPT LANGUAGE="JavaScript" SRC="lib.js"><!--
function on() { ; } ; function off() { ; }
// -->
</SCRIPT>
```

Incidentally, I suspect that I still test for browser type inside the library file, even though it's probably not needed. However, old habits of defensive programming die hard.

You can have several <SCRIPT> sections in the HTML file and unsurprisingly they are executed in order of definition, as if there were no intervening HTML. If you need to set up page dependent values, you can pull in the routines first, and then write a script section that uses them.

Again, you need to beware that the routines may not have been included at all and take steps to avoid code that calls undefined functions.

### Frames

Browser frames have always been an issue with many designers. Initially, not all browsers supported them and we had a plethora of 'framed' and 'unframed' sites. Some people dislike frames intensely because they don't handle the address box at the top of the browser 'properly' and so you cannot derive a URL for the page at which you are looking.

Netscape browser versions still cannot correctly print the framed image that you are seeing. I suspect this is because, when printing, Netscape tends to ask the server to resend the pages and reconstructing a set of frames for printing is complex. Actually, the feature of secretly resending the request for the page can have bad effects if that request causes some action to occur on the server. For example, a user gets to the end of an ordering sequence, and the last button press stores the data supplying a 'thank you' page. It's common for the 'thank you' page to be the receipt for the transaction. The user naturally prints that page, which resends the order, attempting to store the data again. The user is oblivious that they have transmitted the order twice.

Nevertheless, I now feel confident to use frames where they will enhance the final product since 'all' browsers will support them (even recent versions of Lynx). I try not to use them for complete sites, although this does happen. The big issue is what should be done to enhance the visibility of the final site to search engines without having to duplicate the site completely in an 'unframed' version.

In general, the frames on the page can be split into 'navigation' and 'information'. One viable strategy is to allow search engines to move around the 'information' pages by providing explicit links on each page to the information substructure. Remember that search engines are not JavaScript equipped and want to see static links. The links on the page can be visible, designed to allow humans to load the frame area on the screen with new information, while keeping the global site navigation in place. Alternatively, you can insert invisible links by wrapping an HREF around an invisible pixel. You can then use a <NOFRAMES> section on the <FRAMESET> page to point into this nest of informational links.

To make this clearer, consider this example. The home page of the site home.html contains something like:



```
<FRAMESET>
  <FRAME SRC="nav.html">
  <FRAME SRC="a.html">
</FRAMESET>
<NOFRAMES>
We have an interesting page:
<A HREF="a.html">a</A>.
</NOFRAMES>
```

Then the a page contains:

```
See <A HREF="b.html">b</A>
```

When the user loads this page with a browser they see the navigation frame and the contents of a. They can click on the link in the a page to load the framed area with b, and assuming that b has a link to a, then they can reload the frame with a. When a search engine sees the home page, it will ignore the frames and will just find the link to a and by following that will find b.

The approach is used quite commonly and works well, both for the live site, allowing viewers to load parts of their screen with new information, and also for search engines that pick up real URLs with different keywords and information.

#### Putting sites back into frames

However, the approach will increase the number of people who can end up on the site with their browser showing a page that is 'information' but is not displayed inside any global frame. The search engine will point them directly to a or b and they will not be presented with the global navigation screen. The good thing is that the site will still work for them,

they can move around between a and b, because there are links available to provide the functionality. The bad thing is that they will not see the global navigation screen and so will not escape to other parts of the site.

Ideally, I like to 'put the screen back together for them'. JavaScript books give you a hint about how to do this. In a or b, you insert:

```
if (top.location.href == self.location.href) {
  top.location.href = "http://site/home.html";
}
```

This is a little magic. The 'top' and 'self' objects are both windows, and the programming model recognises that top is a special name for the 'root' window of the frame sequence, and self is the name for this window. Windows have a 'location' property that tells you the URL that the window contains. So the first line is comparing the URLs of the top window and the current window. If they are equal, then the current window is not part of a frame sequence and we can force JavaScript to reload the window by giving it a new location. The browser ditches the current page and reloads the new one.

The location property is read-only in JavaScript 1.0, so this trick doesn't work in IE 3. You can use the SRC= trick that I described above to hide the statements from the browser. (If you have a site that you don't ever wish to appear in a frame, possibly of someone else's making, you can invert the test on line one of the script and dispense with the frame.)

You'll find that this all works quite nicely. However, it's not the full story for frames. What happens if the user attempts to access b? The JavaScript will kick in, load home.html and they will be presented with the navigation frame and the contents of a. The result is likely to be downright confusing.

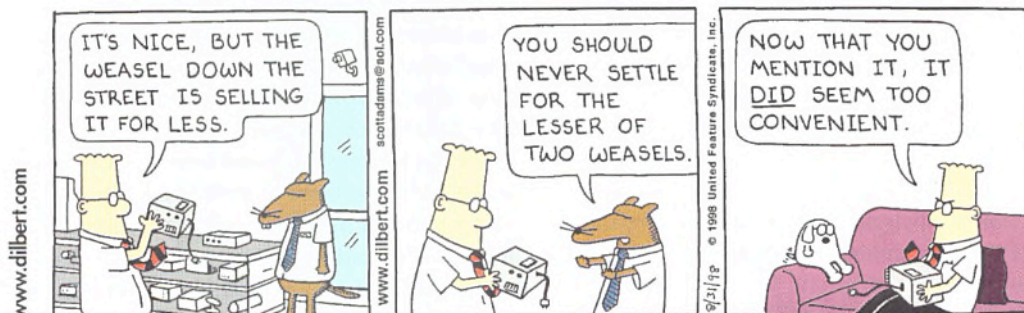
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The problem is that `home.html` has `a.html` coded directly in it. I first thought to use JavaScript's `document.write` function to output a replica frameset from `a` or `b`. This fails because the initial test for location depends on the URL of the frame setup page being different from the URL of the frame itself. You end up with a recursive mess. What we need to do is to load `home.html` and supply it with a variable in place of `a.html`. The only simple way of passing info between HTML pages is to use the query string in the URL. So we pass the name of the page that should be loaded into the informational page in a query string. The setup code is:

```
if (top.location.href == self.location.href) {
    top.location.href = "http://site/home.html?" +
        self.location.pathname;
}
```

We now need to add something into `home.html` that understands what is happening and creates the frameset appropriately. It turns out to be better to write out the whole frameset from JavaScript rather than inserting the odd line into the middle of the extant setup. This code is inserted before the static frameset definition in `home.html`.

```
<SCRIPT LANGUAGE="JavaScript"><!--
document.writeln("<FRAMESET>");
document.writeln("<FRAME SRC=\"nav.html\"\"");
dest="a.html";
if (top.location.search != "") {
    dest = top.location.search.substr(1);
    top.location.search = "";
}
document.writeln("<FRAME SRC=\""+dest+"\">");
```

```
document.writeln("</FRAMESET>");
// --></SCRIPT>
<NOSCRIPT>
```

Note that the fragment ends in a `<NOSCRIPT>` tag and a corresponding `</NOSCRIPT>` needs to be placed after the final `</FRAMESET>` in the original example. The code here generates the frameset. If the query string is set, then its initial '?' will be removed and the remainder set up as the path for the informational frame. I then clear the search string, so the user doesn't get to see what is going on. They are presented with the same address in the URL box as if they had entered the site using the usual route. Again, this is not supported on JavaScript 1.0 and so the fragment really needs to be placed into a file to avoid the code being used in IE 3.

The solution is in place and will work when the user has JavaScript turned on and has an appropriate browser. ■

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## Further reading

I've been using two books from O'Reilly and Associates. First, *JavaScript, The Definitive Guide* is by David Flanagan. It's in its third edition and is ISBN 1-56592-392-8. The book that started me thinking that I might be able to rectify the problems with frames is *JavaScript Application Cookbook* by Jerry Bradenbaugh. Its ISBN is 1-565592-577-7.

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JaCC 99 - the software developer's conference  
ACCU (the Association of C and C++ Users) and EXE have put together a unique conference for all Java, C and C++ developers over four days at the world-famous Oxford Union, featuring expert speakers including Jim Coplien, Kevin Henney, Barbara Moo, Andy Koenig, Nigel Warren and Bertrand Meyer. Preferential rates are available for EXE subscribers and ACCU members.  
Check the schedule at the link below for the latest updates (two new sessions on Wednesday: *Solaris Technology* and *COM as a better C++*, *COM+/MTS as a better COM*; and a swap of sessions between Friday and Saturday).

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**WebClasses - extra tuition**

Jon Perkins continues his coverage of the WebClass technology introduced in Visual Basic 6.0.

Last month I discussed the basics of WebClass technology, notably the simple Request/Response model that facilitates the passing of information from client to server and back. This month I am expanding the topic to provide deeper coverage of this same issue, and to explain how a web-based application can retain state information. As before, I will be including fundamental web-development issues because there are still many developers who have yet to make this step into the brave new world of the Internet.

**Sending client data to the server**

Web pages are, more often than not, a one-way flow of data. The user requests a specific page, for which a navigation request is passed to the server, and then the next page is sent back down. Sometimes, however, the user needs to send data up to the server, for example to send in registration details for a newly purchased software product. This is implemented by setting a section of the HTML page with form tags, specifically `<FORM>` and `</FORM>`.

Within this defined region exist individual items such as text boxes, radio buttons, check boxes, and so on. Two standard components that are also used are a Submit button and a Reset button. The Submit button sends the data that has been entered into the form up to a previously determined URL, while the Reset button initialises the values of each control within the form region. A single HTML page can contain multiple forms, but each separate form will need to have its own Submit button.

The form tags themselves have a couple of parameters that are worth

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# Good intentions



Adding a helper function will make the class work more efficiently. Maybe.

Francis Glassborow warns about adding virtual functions .

A feature of C and C++ is that they both require responsible users. Neither language is designed to protect against abuse, be it conscious or through ignorance. Unlike some languages, C and C++ both require that the user understand them at least at the level they are using them. The level and kind of knowledge required from a library designer is very different from that of a user of a library. The mindset of a library user may legitimately be very different from that of a library designer and implementor. In particular, the two groups may have a quite different perspective on access qualifiers and virtual functions. Having the wrong view can be very dangerous.

How do you view the three C++ interfaces: the `public`, `protected` and `private` ones? What do you need to know about these interfaces in a base class when using or writing a derived class? When designing a base class what should you consider about derived classes? For many years I blithely believed that `private` was only of concern to the owner of the class, the `protected` interface only concerned those programming derived classes and the `public` interface was for everyone.

If I looked at the `public` interface of a class, I knew what it could do for a user. I even knew the result of using pointers (or references) whose static type (a pointer/reference to base) was different from their dynamic type (pointer/reference to derived). The `virtual` keyword warned me that the dynamic type might matter.

Considering how verbose C++ can get, and that it once had a keyword `overload` to implement overloading, it has always puzzled me that the over-riders of a `virtual` member function do not need to be specified as `virtual`. Yes, it is true that the compiler will be able to see the entire inheritance tree and so will know if a function is an over-riders of a `virtual` function in some remote base class, but how many users check all the way up the inheritance tree? When we have programmers creating types with hundreds of ancestors, such checking could become very tedious. I think it would have been friendlier if the language had imposed an extra burden on programmers by requiring a currently redundant `virtual` qualifier to be required for an over-riders of a `virtual` function. Trying to retrofit this, even as a vendor-provided option, is unlikely to work because such a diagnostic would be very noisy on most legacy code. The alternative of introducing a new explicit `~virtual` to specify that a function is not an over-riders would not be popular either. Such an expression would more likely be used as some form of C++ finaliser to mark the end of polymorphism for a function.

Look at this very simple piece of code:

```
class Base {
public:
    Base & foo();
};
```

And imagine that a client writes the following:

```
class Derived : public Base {
public:
    Derived& foo();
private:
    void bar();
};
```

Time passes and one day I decide that my class could work more efficiently if I added a helper function. The new version of my class becomes:

```
class Base {
public:
    Base & foo();
private:
    void bar();
};
```

At this stage there is no problem because nothing in the private section of `Base` can be accessed by `Derived`. I have no dynamic behaviour (late binding), so all pointers and references will behave in accordance with their static types. But look how the issue changes on the day that I decide that it would be even better if derived classes can provide their own implementations of `bar`, and make that function `virtual`. I have just changed the behaviour of all `Derived` objects that are accessed through references and pointers to `Base`. The change in itself may not be a bad idea, but the writer of `Derived` had no idea that the member he provided could be used by anything outside `Derived`. It could be fatal if used in any circumstance other than that intended by its implementor.

I will leave why anyone would want to have a private `virtual` member for another time. There are good reasons, and there are even advocates of a coding style that rejects the use of `public` `virtual` functions. The point I want make here is that adding `virtual` functions to a published class is very suspect and even making them `private` does nothing to alleviate the dangers. Not only should you not remove or modify `public` members of a published class, you should not add or remove `virtual` members. That includes adding or removing `virtual` from a member function declaration.

## Last month's problem

There are subtle differences between `enums` in C and in C++. One of them is that a C `enum` is required to have an underlying type. Indeed, if the capacity is sufficient then that type must be an `int`. C++ does not consider an `enum` to be an integer type. Given that `mytype` has been defined as an `enum`, what problems might you encounter when the following code executes?

```
void delay( mytype mt ) {
    while (mt > -1) mt = (mytype) (mt - 1); }
```

I mentioned both C and C++ in the problem statement but I did not indicate whether the resulting problems were in a C or a C++ environment. This was deliberate. I wanted readers to think carefully about both the gross and the subtle differences between the languages.

If the definition of `delay` compiles with a C compiler, we can deduce that `mytype` has been provided as a type name via a `typedef`. Programmers often miss that requirement when they have used a C++ compiler to check their newly written C source code. This is particularly problematic for novices who have elected to learn C but are using a C++ compiler without switching it to C mode.

As long as the maximum value provided in the definition of the `enum` will fit in an `int`, I do not think that there is any other compile-





time problem for C users. The code will steadily decrement `mt` until it reaches zero. The next decrement will then make it -1 and the loop will end and the function will return. If the underlying type for `mytype` needs to be an `unsigned int` (that is, the maximum value will not fit in an `int` and there are no specified negative values),

there is a problem because the control expression for the `while` loop will always evaluate as true. I would hope that a respectable compiler would diagnose this problem (comparing an `unsigned int` with a negative value is detectable at compile-time).

When we turn to C++ we get a very different situation. That cast in my code is no longer an option; assignment to `enums` requires a cast unless the value being assigned is already of the correct type. That latter condition is rarely met because almost anything you do to an `enum` will result in a conversion to an integer type unless you have meticulously overloaded the arithmetic operators for your enumerated type.

C++ places a different restriction from C on the underlying type for an `enum`. C++ simply specifies that the type shall not be 'larger' (my word) than an `int` unless that is necessary to represent the whole range of provided enumerators. In other words, the underlying type can be any integral type (including bitfields), `signed` or `unsigned`. I can find nothing that prevents the compiler from using `unsigned` types whenever there are no enumerators with negative values. The intent is to give implementors the maximum liberty to optimise the amount of storage required by your data. It has an unfortunate side

effect. I will need to read the documentation carefully to discover if code such as the body of my function `delay` will work as I expect.

This leads me to propose a simple coding guideline. If you are going to compare values of an `enum` with negative values, ensure that the definition provides at least one enumerator with a negative value.

#### This month's problem

The speed fanatics like to use the following initialisation idiom:

```
struct X {
    int x[1000];
    X * xp;
};

void fn() {
    struct X zero;
    memset(zero, 0, sizeof(zero));
    // ...other code
}
```

Why do they do it? Why is it a dangerous idea? Can you suggest a better way of achieving the desired end? ■

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# Version city



**Philip Brown designs a class that hides raw access to the standard Windows format for version information.**

Since the earliest computer programs were deployed, developers have wanted some way of identifying which version a customer was running. After all, it's obviously worthwhile to know if a bug they're reporting has already been fixed. Fairly quickly (and obviously) a numerical system evolved, simply incrementing the version number each time a release was made. As the frequency of releases increased, developers wanted to have some way of distinguishing a major new release compared with an interim one: the concept of major and minor versions of a program was introduced – going from V1.12 to V2.0 conveyed a lot more (even to lay users) than going from V12 to V13. For many years the major and minor version was adequate and commonplace, but as programs grew larger and complex requiring more frequent bug-fixes a tertiary number was tacked on to the end of the version to indicate a 'release'. All releases with the same major and minor version numbers should have an identical feature list, but could include cumulative bug fixes and other enhancements without adding new features as such. Latterly, it has become good practice to append the build number to the release, resulting in a complete version number with four components: X.Y.Z.B, where X represents the major version, Y the minor version, Z the release number and B the build number (see Table 1).

Although marketing departments hijacked the concept of version numbers for their own ends, it is still very useful to have some kind of a formal version number in your applications. It is much easier to confirm that your client is running Build 134 or later, rather than 'SuperApp 97 SR-2a Patch 13 (Y2K)'. This became particularly important with the advent of shared DLL libraries that could be replaced by a freshly installed application. Although not terribly good at using the numbering scheme consistently, virtually all Microsoft application files (EXEs and DLLs) now contain some kind of 4-digit version number embedded within them. Indeed, Windows 2000 makes extensive use of this information in an attempt to prevent important system files being overwritten by earlier, or sometimes later, versions.

## Embedded version information

If you right-click on an EXE or DLL file in Explorer, the popup menu that appears has an entry at the bottom called Properties. Selecting this shows some details about the file. If available, the second tab (called Version) shows the information embedded within the file about the version number, product name, copyright details and so on. Any file that can have a resource segment can have this information embedded in it, and this includes applications compiled with Delphi. Microsoft has published the format that must be provided in the resource section for this information to be displayed. In Delphi 2, this could only be achieved by creating a resource file with exactly the right strings in it, compiling it separately with the resource compiler and then linking it into the application (this forming part of the main build process). Although not difficult, few application developers could be bothered. Within its ethos of making Windows development more productive, Delphi 3 introduced a special dialog where this information could be easily attached to the application. This dialog is available from the Delphi Project menu, Options item.

By ticking the checkbox at the top of the tab to show that version information should be included, it is possible to add flags about whether the build is intended for public release and details about the version number. Furthermore, at the bottom of the tab, it is possible to add details to a whole list of predefined categories, such as a description of the file and the copyright notice. Delphi automatically changes the FileVersion category as the module version number details above are updated. When this dialog is confirmed, Delphi constructs the necessary resource file (which also contains such details as the application icon) in a transparent step, and this will be automatically linked into the final executable. You can now right-click on the executable and obtain version information, just like all well-behaved Windows applications.

## What version am I?

Now that we know how to place version information within the application, it would be useful to access that information. After all, if you are trying to establish over the phone what version a user is running, nothing could be easier than to display the About dialog, which could contain all such details.

As the version information is stored as strings in a specific format in the resource section of the application, it would be possible to use standard Win32 resource file commands to extract the relevant information. There are, however, some specific Win32 API commands available that do just this in a much more convenient form. These are `GetFileVersionInfoSize` (which returns details about the space required to store the version information), `GetFileVersionInfo` (which extracts the details into a pre-supplied buffer of the correct size) and `VerQueryValue` (which extracts a named piece of version information from the buffer, such as `LegalCopyright`). As is usual when interacting with the Win32 API, these commands must be called in the correct sequence, preserving certain internal values returned from previous commands through `var` parameters.

It is a very good idea to encapsulate any kind of interaction with the Windows API with a more user and Delphi-friendly interface. Typical Delphi programmers don't want to deal with allocating memory blocks and Win32-specific types such as `DWORD` and `UINT`, and neither should they. This has the added advantage that, should the storage of

Component	Describes	When to increment
X	Major	After significant changes have been made to the application
Y	Minor	After new features have been added to the application
Z	Release	Every time a minor release is made available with bug fixes
B	Build	Every time the build process completes

Table 1 – Components of version number X.Y.Z.B.





this version information ever change, the same class can encapsulate the system dependencies while maintaining the same public interface.

There are a few things to consider when designing this class. First, it should be usable with any application file. Second, it should provide

convenient access to the standard and most commonly used version information keys (FileVersion, ProductName, etc). Lastly, as it is possible for the user to provide additional custom version keys and values within their structure, the class should expose these in a natural way. Listing 1 shows the public interface for this class.

As can be seen from the class, all of the standard key names are exposed as named properties, while the `Key` property provides access to additional custom information by name. The class is constructed by passing in a fully-qualified path and filename from which version information should be extracted. There is one very interesting aspect about this class that demonstrates an under-utilised aspect of Delphi class design: using the `index` identifier to map a number of different properties onto the same accessor function. The private implementation of `GetVersionInfo` used as the read accessor function for the properties has this index value passed in, allowing the function to determine which value to return. This often facilitates very concise coding.

As mentioned, the `GetFileVersionInfo` function extracts the details from the resource section and stores them in the buffer passed as a parameter to the API call. It therefore makes sense to perform this as a one-off operation in the constructor. Once this information has been extracted, we can interrogate it for known key names. For convenient coding and an increase in performance, we will extract key values for all of the standard key names and store these values in an array with the same ordinal value as each property index. This means that the implementation of the `GetVersionInfo` property accessor function can be transparently simple and just return the array value at the supplied index. For the custom keys that might additionally be provided we will simply call the API command to extract the details from the version information buffer. Although this will be slightly slower than accessing the details direct from a pre-calculated array, it is not anticipated that these properties will be frequently accessed. A

unit containing the full implementation of the `TVersionInfo` class is available from EXE OnLine.

One of the nuances of the way that version information is stored within the application resource section is that it is possible to define which language character set has been used to create the version information (and the application or DLL itself). This is defined as a double word, or 32-bit unsigned integer, and must be present as part of the version information string (in hexadecimal format) for each key that is extracted. One of the jobs of the constructor, as well as extracting the version information into a string buffer (a convenient way of storing static data returned from the API calls), is to extract the language and character set information and to build up a correct hexadecimal string that will be used in future calls to `VerQueryValue`. Once this has been done, the constructor then makes a call to the routine that actually returns a version information value for a supplied key. This routine lives a double life, additionally masquerading as the accessor function for the key property. Again, an interesting aspect of this process is that the constructor obtains a list of the standard key names from a private constant fixed string array that is declared and defined in a single statement. This too is a little-used, but very handy, technique that is also allowable for global variables as well as constants.

Referring back to the project information dialog you will see some extra versioning information in the 'Module attributes' group – mainly a set of flags describing the status of an application. This information is also available within the resource file, and can be accessed using the `VerQueryValue` API command, but with a second parameter of just `\`, rather than `\VarFileInfo\Translation`. In this instance, `VerQueryValue` returns a pointer to a structure that contains details about file type and content – double word pairs that can be combined to represent a strict 64-bit version number used for numerical comparisons (by installation programs) – as well as the Module attributes definable within Delphi. It would be a simple task to extend the `TVersionInfo` constructor to extract this information and expose it via simple boolean properties and, in Delphi 5, `Int64` property types for the strict version numbers.

### Completing builds

It would be extremely nice if, having successfully completed, a build process could increment the build number (and possibly release number) within the version information for all deliverables. Delphi appears to store this version information within the `DOF` file that accompanies the project. This follows `INI` file format and contains most of the details exposed by the Project, Options dialog. However, programmatically making changes to this file (there are entries in the [Version Info] section for things like MajorVer, Release and so on) does not actually result in any changes to the compiled application. This is because Delphi generates the compiled resource file (`Project.RES`) from this information only when it is changed interactively from within Delphi itself. This means that making changes to the `DOF` file and then recompiling the application does not cause the resource file to be regenerated and the out of date one is used. It is good practice therefore to update the build and release numbers of each Delphi project by hand at the end of each successful build. ■

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The code for this article is available on EXE OnLine and via ftp at [ftp://ftp.exe.co.uk/pub/exestuff/200003\\_delphi](ftp://ftp.exe.co.uk/pub/exestuff/200003_delphi). **EXE ONLINE**

```
TVersionInfo = class
// ...
public
  constructor Create (ThisSourceFile: String);
  // Arbitrary key information
  property Key[KeyName: String]: String read GetKey;
  // Standard key information
  property CompanyName: String index 0
    read GetVersionInfo;
  property FileDescription: String index 1
    read GetVersionInfo;
  property FileVersion: String index 2
    read GetVersionInfo;
  property InternalName: String index 3
    read GetVersionInfo;
  property Copyright: String index 4
    read GetVersionInfo;
  property TradeMarks: String index 5
    read GetVersionInfo;
  property OriginalFileName: String index 6
    read GetVersionInfo;
  property ProductName: String index 7
    read GetVersionInfo;
  property ProductVersion: String index 8
    read GetVersionInfo;
  property Comments: String index 9
    read GetVersionInfo;
end;
```

Listing 1 – The public interface of `TVersionInfo`.



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# Java on a Stik



The size of a stick of chewing gum, it's a TCP/IP node with its own JVM.

John Wilson couldn't resist investigating.

The folks at Dallas Semiconductor have been producing interesting Java implementations for a while now. They made the famous Java Ring that was given to each attendee at the 1998 JavaOne conference. The ring is impressive but limited, being basically a smart card in a different form factor. Last August I visited their website to see what new stuff they were doing ([www.dalsemi.com](http://www.dalsemi.com)) and discovered something called TINI.

TINI (Tiny InterNet Interface) is a 68-pin SIMM board (it is about the size of a stick of chewing gum). On the board is a processor, 512 KB of Flash ROM, 512 KB of battery backed up RAM, a 10Base-T Ethernet port and two serial ports. The Flash ROM contains a multi-tasking multi-threading operating system with a fully functional TCP/IP stack. The OS runs a Java Virtual Machine and Telnet and FTP servers. The stick (or 'Stik' as Dallas spells it) costs \$50.

In order to develop and test software for the TINI you have to plug the Stik into a \$35 socket board and apply power and a serial connection to a PC. Dallas supplies a Java program that talks to the TINI over the serial connection and allows you to load the firmware into the flash memory. You can then compile programs for the TINI using the normal JDK tools. The resulting class files are combined into a special archive format before being transferred to the Stik.

## Stages of development

I placed my online order for a Stik and a socket, downloaded the alpha firmware and documentation and began to read and wait for delivery. I was lucky; my boards turned up within two weeks. Dallas has real difficulties in delivering samples of this board quickly. On delivery, I plugged the power supply and serial cable from an old modem into the socket card, connected the serial interface to my PC and ran the Dallas JavaKit application to install the firmware and a couple of demonstration programs. I had a running TINI in less than half an hour. A 10Base-T drop cable connected the socket board to my hub and I was able to ping the board. One of the sample applications was a simple Web server – that worked too!

However, I didn't buy the kit to run demo programs – I wanted to see how well it ran my code. Developing with TINI is a multi stage process:

- Compile and test your program on your main development system. This means that you can use your familiar IDE with a decent editor and debugger.
- When you are happy that your program does something useful, you recompile it using the Sun JDK compiler, telling the compiler to use the TINI `java.*` packages rather than the standard JDK ones. In the early alpha versions of the TINI software there were significant omissions in the Java package support. As time has gone on many of those omissions have been filled, but there are still some left: reflection, for example. (TINI does not use standard jar archives but instead uses its own tini archive file format. The tini archive is far smaller than an equivalent jar file. The jar file containing one of my programs is 20,010 bytes long while the equivalent tini archive is only 8,714 bytes. Dallas supplies a Java utility called TINIConvertor.)

- FTP the resultant tini archive to the Stik.
- Run the program from the TINI command line.

I found that my 'hello world'-style tests worked well enough, but more substantial programs rapidly showed up the alpha nature of the Java implementation. The version of the firmware that was available last September lacked `long`, `float` and `double` support. Furthermore, some standard packages were missing, as were groups of classes within those packages that were supported. As `long` was not available, some methods took `int` arguments when they should have taken `long`. The network code was pretty fragile and even simple networking programs would only run for a few hours before the system needed rebooting. Dallas made no pretence that the code was other than alpha quality and the system did just enough to convince me that it would be a rewarding experience to persevere. I looked around for the simplest useful thing that a TINI could do on a network and settled on a time server.

## A time server

There are several time protocols in common use over TCP/IP. I decided to implement three. DayTime (RFC 867) is the simplest; it just returns a text representation of the current date and time. Time (RFC 868) is slightly more useful in that it returns a standardised binary representation of the date and time that can be reliably used to set the clock of a client machine. NTP (RFC 1305) is the business; with a sufficiently accurate time source it can be used to synchronise clocks to a very high degree of precision. Time and DayTime have both UDP and TCP versions, NTP is UDP only.

TINI is quite slow. The JVM interprets all the bytecodes (there is not enough memory for a JIT compiler) and the processor is a supercharged 8051 (a highly evolved descendant of the 8-bit processor used to handle the keyboard on the original IBM PC). I found that string operations were particularly slow and had to recast part of the program to use byte arrays instead. On the other hand, thread support was very robust. I rapidly implemented a small program with five

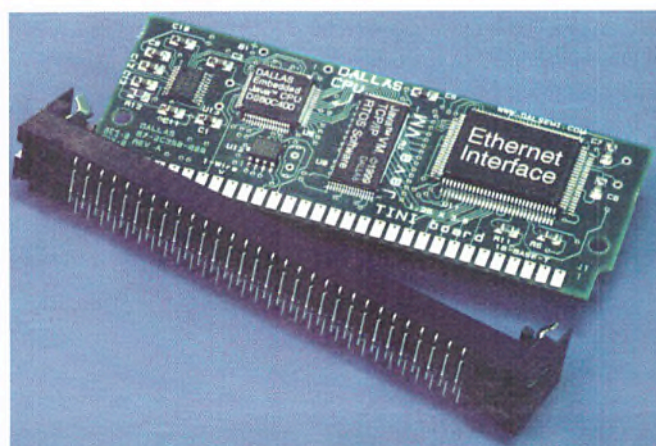


Figure 1 – The TINI (Tiny InterNet Interface) board.





## A TINI programmer must acquire (or re-acquire) the miser's mindset that was needed in the early days of the micro revolution.

threads that listened on the correct ports for the incoming requests and sent dummy responses. Under light load this would stay up for between one and four hours before locking up and needing a reboot. The round trip time to the TINI was about twice the time to a public time server on the Internet (130 ms as opposed to 60 ms).

Since September, I have had three releases of the firmware. Performance has improved (the latency to the TINI is roughly the same as to a public time server). More of the language has been implemented, including `long` (which is a blessing when trying to manipulate 64-bit timestamps). Reliability has improved remarkably and the TINI runs for weeks on end. I am now investigating how to interface the Stik to sources of high quality time, such as a Medium Wave radio receiver and a GPS receiver. In the rest of this article I will talk about lessons learned when programming such a small system in Java.

### Java in the small

Coding and testing on a big system and transferring the bytecodes unchanged onto the small system is a mixed blessing. On the plus side you have access to a high quality IDE so the code, test, debug cycle is very efficient. This is counterbalanced by not having the memory or processing resources of your PC on the TINI. You have to be continually careful with resources. The heap is not very large, so creating large objects must be done with caution. The filesystem is implemented by claiming RAM from the heap, so writing data out to a file may not actually save space. And writing a log file that is not regularly pruned is a good way to ensure that your system will fairly quickly freeze. A TINI programmer must acquire (or, for us oldies, re-acquire) the miser's mindset that was needed in the early days of the micro revolution.

## TINI resources on the Web

The iButton is a Dallas Semiconductor product that is designed to be durable enough for a person to wear on a digital accessory like a ring, key fob, wallet or badge.

[www.ibutton.com/TINI/index.html](http://www.ibutton.com/TINI/index.html)

The Systronix TINI Evaluation Platform (STEP) is a 100x160 mm development and prototyping board.

[www.systronix.com](http://www.systronix.com)

The introductory page of the `TiniHttpServer`, a multi-threaded HTTP server for TINI that supports Java Servlets.

[www.smartsc.com/tini/TiniHttpServer/](http://www.smartsc.com/tini/TiniHttpServer/)

Source code from my work with TINI.

[www.wilson.co.uk/Software/Tini/TiniTim.zip](http://www.wilson.co.uk/Software/Tini/TiniTim.zip)

The behaviour of the garbage collector on TINI surprises many new users. The collector does not kick in until the amount of free space in the heap falls below a fixed amount (about 64 KB at the moment), but there is a very good reason for this. TINI is generally running only a single application (even though the application can consist of several processes and tens of threads). Rather than run the collector continuously in background and steal instruction cycles from the application, the collector expects to be explicitly started by the application with a call to `System.gc`. The theory is that the application has a better chance of knowing when it is convenient to collect garbage than the JVM. If the application doesn't call `System.gc` at all, then the collector will run at the last minute to save its bacon. To write a successful TINI Java program you really need to take the physical limitations of the platform into account.

Many TINI applications will run unattended for a long time. Many will be installed in relatively inaccessible places. And many will only have an Ethernet interface to the outside world. These constraints force the TINI developer to program defensively against many forms of failure that are not generally considered in mainstream Java. You must not only consider failures in the Java program itself but also in the underlying firmware and hardware. For example, the TINI has a hardware watchdog timer that can be activated from the Java program. Many programs will need to set and regularly 'feed' the watchdog timer. A failure to feed it will result in the system being rebooted. While this allows the system to recover from a wide range of failures it does require the programmer to deal with the task of restarting with the filesystem in a mess and a set of potentially broken connections to the outside world. All this stuff is familiar to programmers working in C and assembler with the smell of solder in their nostrils but it comes as a bit of a shock to us effete Java programmers.

### Getting to the guts without JNI

TINI comes with some platform-specific packages that allow the Java programmer to get at the guts of the system without resorting to JNI. There are methods for getting and setting the IP address and the MAC address of the Ethernet interface. You can get and set the subnet mask, a default gateway, DNS servers, an SMTP mail relay server, an HTTP Proxy server IP address and a port. TINI can be a DHCP client and there are hooks to let a Java program initiate and monitor the DHCP lease negotiation. The firmware supports sending email via an SMTP relay and there are calls to allow a program to send email. And there is a very basic HTTP server built into the system, which makes it easy to display simple status information on Web pages from within a program.

There are also classes that let the Java program select I/O ports via the Stik's bus and to read and write data on these ports.

Dallas Semiconductor has a proprietary multi-drop serial bus called 1-Wire. The Stik has onboard support for this bus and a package provides classes that can communicate with devices on this bus. A/D converters, switches, temperature sensors, relays, non volatile memory and cryptographic processors are among the devices that can be accessed.

The TINI Java environment is very rich while at the same time very constrained. The main uses for the device seem to be in acting as a glue layer between some hardware and a TCP/IP network. If you want to put your toaster on the Internet, this is the device for you. ■

*John Wilson is Managing Partner of The Wilson Partnership. He is interested in many things – one of them is Java. He can be contacted at [tug@wilson.co.uk](mailto:tug@wilson.co.uk).*



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# Getting started with XML



The handling of data across the Web is evolving. Jon Perkins suggests that it's worth getting up to speed with XML.

It's a common mistake to assume that XML is a forthcoming replacement for HTML, but this isn't the case. XML was intended from the outset to be a tag-based markup language complementary to HTML. However, whereas HTML describes the layout of a page, XML is concerned with defining and describing data. This month I am discussing what XML actually is and how to work with it from Visual Basic. XML is a large subject matter so there is no way that I can provide comprehensive coverage; my intention is to provide an overview of the subject in order to acquaint you with it. It might be new right now but it is intended to become widespread very quickly; one of the primary additions to the next version of SQL Server is XML support, and it will be catered for extensively in Visual Studio 7.

## Description of XML

Once the Web evolved to the point where dynamic data started to become commonplace, the need to transport data together with its definition became more pressing. XML, or Extensible Markup Language to give it its full title, is based upon an earlier, more comprehensive markup language called SGML (Standard Generalised Markup Language). The problem with SGML however is that it is a rather complex and broad definition and frankly is something of an overkill. The size of this definition leads in turn to a greater overhead than is necessary. (For another view of SGML see *SGML, it's a beautiful day*, EXE, February 1997.) A body called the XML Working Group formed with the express intention of producing a data defining language that would be easy to use over the Web. This body defined a suitable subset of SGML that carried less of an overhead but was powerful enough to describe data. The upshot of this is that XML is a legal subset of SGML; any XML document is also a true SGML document.

The XML 1.0 specification has been 'recommended' by the World Wide Web Consortium (W3C). This means that XML is defined well enough for vendors to implement it, but technically speaking it isn't yet a standard. As far as Microsoft is concerned, XML 1.0 support was made available with Internet Explorer 4 but Internet Explorer 5 implemented the XML 2.0 specification, which added significant new functionality, most notably something called the XML Document Object Model, which I'll come back to a little later. Actually, IE5 was re-engineered somewhat to make the individual components more granular. This means that the XML support engine, implemented in `msxml.dll`, doesn't necessarily need the rest of IE5 to be of use. In fact, you can obtain the separate XML component from [msdn.microsoft.com/downloads/tools/xmlparser/xmlparser.asp](http://msdn.microsoft.com/downloads/tools/xmlparser/xmlparser.asp).

HTML is a markup language that is based around a standard set of tags. For example: `<h1>My Header Text</h1>` displays the caption 'My Header Text'. Because of the `<h1></h1>` tag pair the browser will identify the text as being one of the predefined header text types and will format it accordingly. Other tags such as `head`, `body`, `form`, `input` and so on are all predefined as part of the working set for a particular version of HTML. When the W3C decides to add tags into a definition a new, formal version number is specified, such as 3.2 or 4. This approach contrasts with XML, in which the author of the file can

declare and then define new tags as necessary. This is where the 'extensible' part comes in.

It is possible for an HTML stream to contain embedded XML sections, which are called *XML Islands*. While HTML and XML are two different specifications, the W3C is also introducing XHTML, which is a properly defined integration of the two. Additionally, the MathML specification was released by W3C as a specific application of XML that supports the use of complex mathematical formulae.

## ADO RecordSet support

How you manipulate XML data depends upon what you want to do with it. If you are working with an ADO 2.1 or above RecordSet object, then you are able to persist the contents of the RecordSet to disk, and then read it back in again later. To illustrate this point we can open a RecordSet from the Northwind database:

```
Set adoCommand = New ADODB.Command
adoCommand.CommandText = "SELECT * FROM Shippers"
Set adoRs = adoCommand.Execute
adoRs.Save "C:\exexml\Shippers.xml", adPersistXML
adoRs.Close
```

and it can then be read in again at a later time by calling:

```
Set adoRs = New ADODB.Recordset
adoRs.Open "C:\exexml\Shippers.xml"
```

The XML produced by the `Save` method is shown in Listing 1 (slightly tidied up from the version that ADO actually produced).

## XML Structure

An XML file is regarded in logical terms as a Document. Encased within this definition are two sub-structures:

1. *Prolog Element*: The existence of this element is optional. Its purpose is to store management information, such as the version of XML that exists within the file. It can also contain a reference to an external Document Type Definition (DTD), if appropriate. A DTD file is merely a means of isolating the definition of the data into a file that is separate from the actual data.
2. *Document Element*: This is the core part of the file. It contains the actual data, as well as the data definition if it doesn't reside within an external DTD.

Looking at the XML code in Listing 1 allows us to get a handle on the layout of the document. This is almost exactly as ADO churned it out, so please ignore the fact that many of the node names are prefixed with `s:` or `z:` (this is an ADO naming convention).

At the start of the file, the keyword `xml` identifies the root node. Everything else that appears within that particular set of angle brackets is really prolog information. At the end of the document is the `</xml>` tag denoting the end of the root node. Beneath the first set of angle brackets are the definitions for two child nodes called `s:Schema` and `rs:data`. The `s:Schema` node then contains the `s:ElementType` node, which declares the row names, and a series of `s:AttributeType` nodes, which each contain subnodes called `s:datatype` that declare the nature of each attribute. Finally, down at the `rs:data` node, each item of data is presented as a `z:row` node.





The DTD provides the context for the actual data so it is clearly important that the data follows these rules. It is the job of the parser to analyse the file while opening it and check it for conformance. This conformance check includes compliance both with the expected layout of an XML document and with the conformance of the data to its own DTD. If a document passes both of these checks, then it is a *valid* document. The downside to performing a validity check is that it can take some time to parse a file. Therefore, there is a less rigid classification for a document: the document is referred to as being *well-formed*. A well-formed document solely complies with the formal rules for an XML document; a DTD is not considered.

### XML Document Object Model

While it is possible to open an XML document as a text file and pick your way through it by monitoring your indentation levels, it is much easier to use an XML parser. Microsoft provides one with Internet Explorer in the form of `msxml.dll`, which resides in the Windows *System32* folder. The parser exposes the XML Document Object Model (DOM for short) and presents the data as a series of objects that you can manipulate programmatically. To connect to this parser from Visual Basic you should select the *Microsoft XML* entry within the References dialog (found under the Project menu).

When loading up a new referenced object for the first time I always find it helpful to fire up the Object Browser in order to have a look at what interfaces are exposed. The most important object within `msxml` is the `DOMDocument` – it is the overall encapsulation of the XML file that you are working with. Elements are broken down into nodes, and each node exposes a `childNodes` collection to help you drill down.

To show how to use the DOM I have written a simple program that demonstrates how ADO RecordSet saves data in XML format. However, the program also provides two different methods of reading the data back in – in this case into an MSFlexGrid component. The interface isn't very exciting, but my intention is to look at the underlying code behind the buttons. In one method the `MoveNext` call navigates the ADO RecordSet, whereas in the other method the XML structure itself is traversed by means of the DOM model. Within this section I also use two different methods for traversing the data. When analysing the DTD to pick out the field names I use a fairly hairy drill down through several collections at once, just to show that you can:

```
Dim xmlFieldNodes As MSXML.IXMLDOMNodeList
Set xmlFieldNodes = xmlDoc.childNodes.Item(0).
    childNodes.Item(0).childNodes
```

Whereas to obtain the data I adopt the more elegant approach of stepping down one node at a time and calling each node by name rather than ordinal position, such as:

```
Dim xmlRootNode As MSXML.IXMLDOMNode
Dim xmlDataNode As MSXML.IXMLDOMNode
Set xmlRootNode = xmlDoc.selectSingleNode("xml")
Set xmlDataNode = _
    xmlRootNode.selectSingleNode("rs:data")
```

There are further comments within the code itself to explain what is going on. You can download the example from either EXE OnLine or my own website at [www.jonperkins.com/exe/col0300.htm](http://www.jonperkins.com/exe/col0300.htm).

### Resources

In terms of available resources, Microsoft Press has released a book called *XML in Action*, written by William J. Pardi (ISBN 0-7356-0562-9, priced £25.99). It makes for fairly dry reading, but this is very much a reflection of the subject matter rather than the writing style – reading raw XML is necessary in order to understand the subject more completely but it isn't exactly riveting stuff. The book covers the theory of the subject in a comprehensive matter, but is restricted to providing the sample code in a generic way. The CD contains quite a rich set of resources that could keep you browsing for hours. For greater coverage of using XML with Visual Basic a forthcoming book from Wrox Press might be worth a look when it becomes available: *Professional VB6 XML* (ISBN 1-861003-32-3).

Finally, Microsoft has made available an XML Code Generator that creates Visual Basic classes from XML schemas, downloadable from [msdn.microsoft.com/xml/articles/generat.asp](http://msdn.microsoft.com/xml/articles/generat.asp). This tool provides a means of working with XML data without having to traverse the DOM in order to get at the data. It is primarily implemented as a DLL so you can add the utility to your own applications should you wish. There is also an XML Resource Kit CD available, details of which can be found at the MSDN site at [msdn.microsoft.com/xml/default.asp](http://msdn.microsoft.com/xml/default.asp).

XML is destined to be a very important technology within the near future and I have tried to provide an introduction to just a couple of pages. There is, however, a lot more to say on the subject so I will be providing further coverage of it. Watch this space!

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

*The code for this article is available on EXE OnLine and via ftp at [ftp://ftp.exe.co.uk/pub/exestuff/200003\\_vb](http://ftp.exe.co.uk/pub/exestuff/200003_vb).*

**EXE ONLINE**

```
<?xml xmlns:s='uuid:BDC6E3F0-6DA3-11d1-A2A3-00AA00C14882'
xmlns:dt='uuid:C2F41010-65B3-11d1-A29F-00AA00C14882'
xmlns:rs='urn:schemas-microsoft-com:rowset'
xmlns:z='#RowsetSchema'>
<s:Schema id='RowsetSchema'>
  <s:ElementType name='row' content='eltOnly'>
    <s:attribute type='ShipperID' />
    <s:attribute type='CompanyName' />
    <s:attribute type='Phone' />
    <s:extends type='rs:rowbase' />
  </s:ElementType>
  <s:AttributeType name='ShipperID' rs:number='1'>
    <s:datatype dt:type='int' dt:maxLength='4'
      rs:precision='10' rs:fixedlength='true'
      rs:maybenull='false' />
  </s:AttributeType>
  <s:AttributeType name='CompanyName' rs:number='2'
    rs:writeunknown='true'>
    <s:datatype dt:type='string' dt:maxLength='40'
      rs:maybenull='false' />
  </s:AttributeType>
  <s:AttributeType name='Phone' rs:number='3'
    rs:nullable='true' rs:writeunknown='true'>
    <s:datatype dt:type='string' dt:maxLength='24' />
  </s:AttributeType>
</s:Schema>
<rs:data>
  <z:row ShipperID='1' CompanyName='Speedy Express'
    Phone='(503) 555-9831' />
  <z:row ShipperID='2' CompanyName='United Package'
    Phone='(503) 555-3199' />
  <z:row ShipperID='3' CompanyName='Federal Shipping'
    Phone='(503) 555-9931' />
</rs:data>
</xml>
```

Listing 1 – Shippers table from the NorthWind database as XML.





I've been a fan of the O'Reilly books for some time now. Their consistent design, layout and style means that referring to any of them during a project causes few distractions and time lost wading through appendices and indexes in search of a syntactical hint.

The *Perl CD bookshelf* (ISBN 1-56592-462-2, RRP £39.95) takes a common feature – the book with a free CD bundle – a step further; it is sold explicitly as six books on CD (*Perl in a Nutshell*, *Programming Perl 2nd Edition*, *Perl Cookbook*, *Advanced Perl Programming*, *Learning Perl 2nd Edition* and *Learning Perl on Win32 Systems*) plus a hard copy of *Perl in a Nutshell*. (For a review of these books individually see *A plethora of Perl publications*, EXE, November 1999.)

The CD is viewed as a website, with a Java-driven search engine that allows you to search all six books quickly and easily. Because the text is presented as a website, all the cross-references are hyperlinks, so 'using' the book becomes much easier.

This selection of material provides all the information needed to write cross-platform scripts (call them programs if you must), with solid chunks of tried and tested code to cut and paste from the CD.

However, of the six books, I found the *Perl Cookbook* to be the most useful. It does exactly what it says on the tin, offering 'a comprehensive collection of problems, solutions and practical sample programs'. As a result, there is real value in this volume: code that is explained and that works.

## *The Perl CD bookshelf* Reviewed by Ed Butcher

Each chapter follows a logical structure, ending with one or two full program listings that build on the various chapter elements. The chapter on CGI programming has a particularly good example of a basic e-commerce script to let people order t-shirts and sweaters via the Web.

The author's writing style also helps make this book easy to use and understand, as it follows the usual 'I'm on your side' O'Reilly feel. Despite the range of topics covered, one never feels either patronised or confused.

The *Perl Cookbook* covers nearly every topic most jobbing programmers would want, but with the companion volumes on the CD, there are few if any questions that can't be answered. As a desktop reference, it has become very valuable in this office.

*Ed Butcher is MD of Red Fuse, a Web development company. He worked on EXE a long, long time ago, before the Web was a twinkle in Mr Berners-Lee's eye.*

### Book details

<b>Title:</b>	<i>The Perl CD bookshelf</i>
<b>Cover:</b>	CD
<b>Publisher:</b>	O'Reilly
<b>ISBN:</b>	1-56592-462-2
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THE SOFTWARE DEVELOPERS' MAGAZINE

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# A better way to spend your evenings?

Don't know about you, but we just love those amusing jokes that get passed round and round by email. Especially the ones that seem to come around every other week. 'We're a lighthouse. Your call.' We can hardly stop chortling even now.

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tee hee hee



# Kent Beck

*This month we feature Kent Beck, a pioneer of patterns for software development, one of the creators of the xUnit family of testing frameworks and the man behind XP. The author of 'The Smalltalk Best Practice Patterns' and 'Kent Beck's Guide to Better Smalltalk: A Sorted Collection', his latest book is 'Extreme Programming Explained'.*



## What was the first computer you worked on?

An 85-pound Philco desktop calculator with nixie tubes and 99 program statements in a sort of assembly language. The demise of nixie tubes was the first step in the tragedy that is modern technology.

The seven segment LED is a work of evil. Two-dimensional grids of pixels only compound the mistake. Like you want to know more about what's going on in that little box...

## What was the first computer language you worked in?

Besides the odd calculator assembly language, I used Basic on a PDP-8E (with paper tape, no less).

## How many computer languages have you used? Are you still fluent?

Maybe 10 or 15, but only two new ones in the last ten years (Java and Perl). I'm currently fluent in two: Smalltalk and Java.

## What was the last program you wrote?

I'm currently working on a web server/wiki in Smalltalk. I'm also developing (with my daughter) a stock market simulator using historical data.

## What was the most difficult project you have ever worked on?

Momenta, a startup producing a pen-based computer. The operating system was basically Smalltalk/V 286 with a whole bunch of stuff on top – handwriting recognition, an object database, and a suite of applications.

I was only peripherally involved, but I spent a lot of late hours on my little part. There were technical challenges, people challenges, marketing challenges, manufacturing challenges. The crater the company made going down is still smoking at last report.

## Systems or applications? Which do you build?

I try to make money for my clients. If I can avoid building anything at all, that's the best solution.

## Are the best software developers born or made?

Made, clearly.

If you're a techno-whiz, you have to learn the people stuff the hard way. If you're a people person, you have to work hard on technical skills. If you're like me, you have to climb both mountains at once.

## Which one aspect of the software industry would you change, if you could?

This attitude that software development is at best an ordeal to be survived. What is good for people is good for business, and in a remarkably short time.

## What advice would you give to someone starting in software development today?

Go into biology. That's where the big leverage is.

## What is your proudest accomplishment, within computing?

Having an impact on the way software is developed. A little impact, and only some software, but from time to time I can hear my own echoes.

This is the goal I started out with as an unendurably arrogant 18-year-old college student. (Since then I've gotten even older.)

## What is your proudest accomplishment, outside of computing?

I'm a husband and the father of five beautiful, intelligent children: Bethany, Lincoln, Lindsey, Forrest and Joelle.

## If you didn't work in IT what would you be today?

A starving folk musician.

## Commercial, shareware, freeware, Open Source?

Since I can't figure out how to make money selling programs, with Open Source I can get the most out of not making money. JUnit (see <http://www.xprogramming.com>) has been a great experience. Erich Gamma is an awesome programmer to work with.

## How do you react to the flames of language wars?

I've been on the edge of the wedge for so long I don't even notice. Smalltalk is clearly the best language. Now if only the rest of the world would notice...

## What is your favourite book?

*Rootabaga Stories* by Carl Sandburg. Great language, weird plots, makes kids laugh – what more do you want?

And a plague of boils on you for limiting me to one. Every time I try to go to the next question I think of ten other books I want to add.

## What is your favourite film?

*The Princess Bride*. I love it that it is both a satire of fantasy/adventure films and a fantasy/adventure film at the same time.

## What is your favourite website?

<http://c2.com/cgi/wiki>

## What is your latest gizmo?

Cindee got me a nice framing hammer the other day. I'm not really a gizmo guy.

## Anything else to be taken into consideration?

Who you work with is more important than what you work on. I've been blessed with great collaborators – Ward Cunningham, Erich Gamma, Ron Jeffries, Curtis Wright (my music partner of 20 years).

Also, I look much better than that picture of me, even though most of the hair is gone.

*Next month: Leen Ammeraal*



# Claire's story and other tragedies

**More verse from Verity Stob, the self-proclaimed laureate of cyberspace.**

## **Garbage collection**

Our careless C++ girl Claire  
Bashed out her brains upon the stair.  
Java Johnson found her dead.  
His emailed message quickly spread:  
'The prospects for the build look bleak,  
Claire's got another memory leak.'

## **Kindness to animals**

Because he was an ignorant lout  
The VB sub's eyes I punched out.  
And when he dared to squawk once more  
I killed him with a monitor.  
My manager was firm with me:  
'Next time don't use TFT.'

## **In Memoriam Borland**

So.  
Farewell then  
Borland.  
  
'Stock price  
Down again.'  
  
That was your  
Catchphrase.  
  
Keith's Mum  
Had a  
Copy of  
Sidekick for OS/2  
On the shelf  
For years.  
  
But I don't  
Think she ever  
Opened  
It.

## **Famous Usenet thread summarised**

On Usenet a young Finn named Linus  
Got involved in a flamewar most heinous.  
Prof Tanenbaum howled:  
'You're ambiguously voweled  
So I'm awarding your  
OS B-minus.'

## **Single Scotch lament**

O Lara, wi' untim'rous breastie,  
Thou gorgeous virtual Sassenach,  
I'd fain nae leave thy tomb unraided.  
Alas! Nae version 4 for Mac!

## **Precedents**

One steamy day at NASA, whence they send ships to the stars,  
They were cutting Ada modules for a stab at planet Mars.  
Now Randy was a new guy, fresh transferred from Hubble  
And at the crucial moment he had some finger trouble.

He poured gallons in his litres, he stood metres on his feet,  
He pressed pascals in his psi, he mixed them up a treat.  
So when the probe descended retro thrust was immaterial  
Just because our Rand mixed SI units with imperial.

*And the coloured girls go:*

*ISO, ISO, ISO 9000.*

*ISO, ISO, ISO 9000.*

Charles Babbage was a proto nerd, lived in the age of steam,  
To build a difference engine was his enduring dream.  
With Ada Lovelace, cyber chick, he sought his powers to double,  
But at the crucial moment they experienced finger trouble.

Charlie asked her 'Ready babe?' and Ada called back 'Yes'.  
But as he turned the handle, the gearing snagged her dress.  
Her crinolines were pulled half off, her ankles were uncovered.  
Poor Charlie had a mental fit and never quite recovered.

*And the coloured girls go...*

There was a certain Doctor, you all know who I mean,  
Who travelled throughout time and space upon the smaller screen.  
He'd always land in quarries and must scabble through the rubble  
For when he'd dematerialised he'd get some finger trouble.

He'd lean back on the console and he'd say 'Hey Sarah Jane!  
'I know I promised beaches but I've bungled it again.  
'The co-ordinates were upside down,

it's entirely the wrong globe here  
'It's Metebelis III outside - do you get arachnophobia?'

*And the coloured girls go...*

When I got in this morning the file server was crawling.  
A D-I-R took 30 secs, response was quite appalling.  
I logged in at the console, my efforts to redouble,  
You will have guessed what happened next:

I had some finger trouble.

While I was in Explorer, due to unknown forces,  
I accidentally pressed Delete and wiped out all the sources.  
The backup is unreadable. Now before you get demented  
Recall that, though disastrous, this is not unprecedented.

*And the coloured girls go:*

*ISO, ISO, ISO 9000.*

*ISO, ISO, ISO 9000.*

*[Tenor sax solo.]*

*(Verity Stob apologises to Harry Graham, E J Thribb, Lenny the Limerick, Robert Burns and Lou Reed for pilfering their styles.  
And thanks Katie B and Mike P, for contributing the ISO 9000 chorus, a rare comfort in times of Audit.)*





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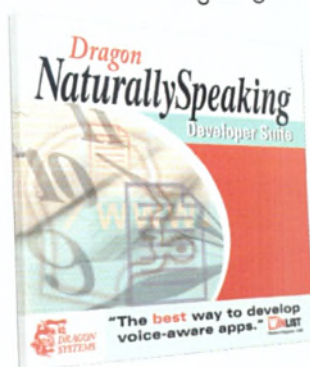
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Closed or Other	144	246
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