August 1996

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EXE

The Software Developers' Magazine

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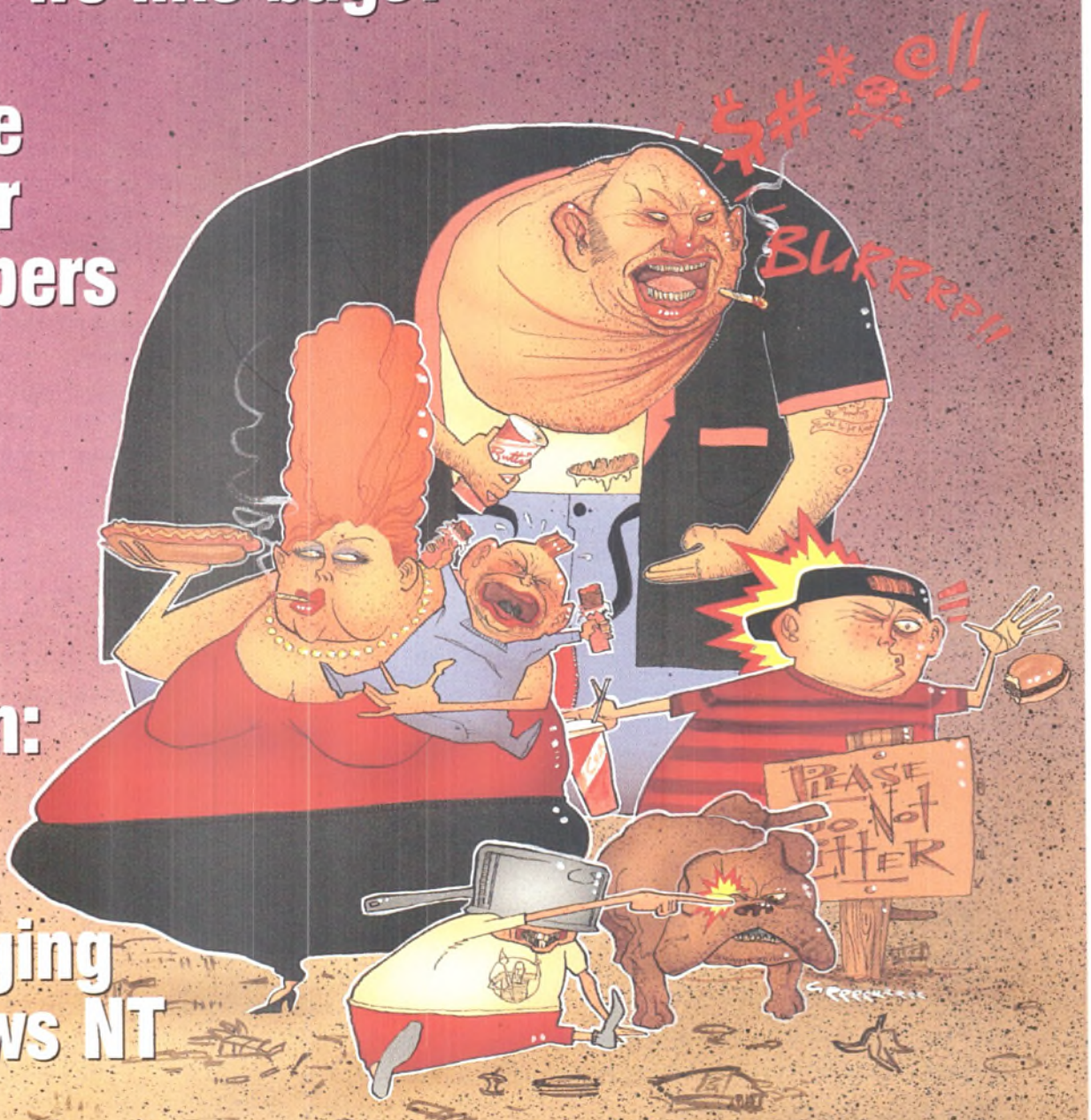

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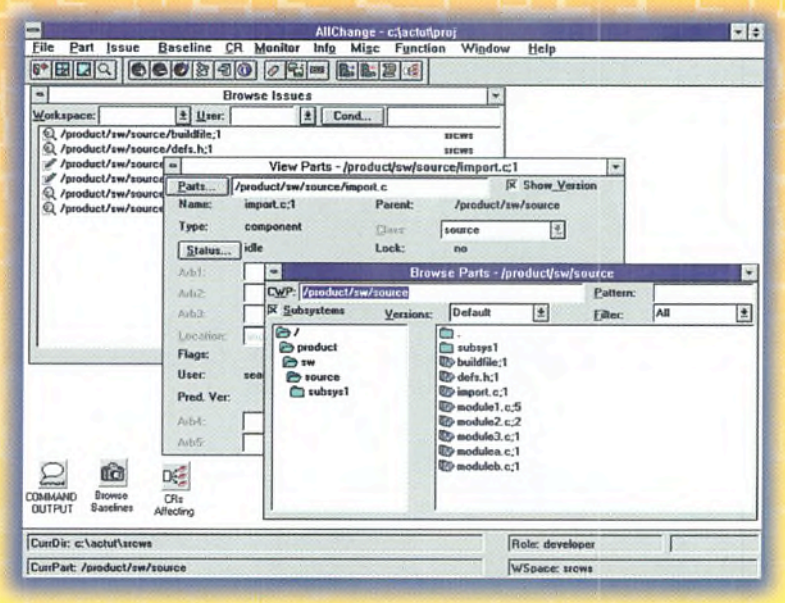

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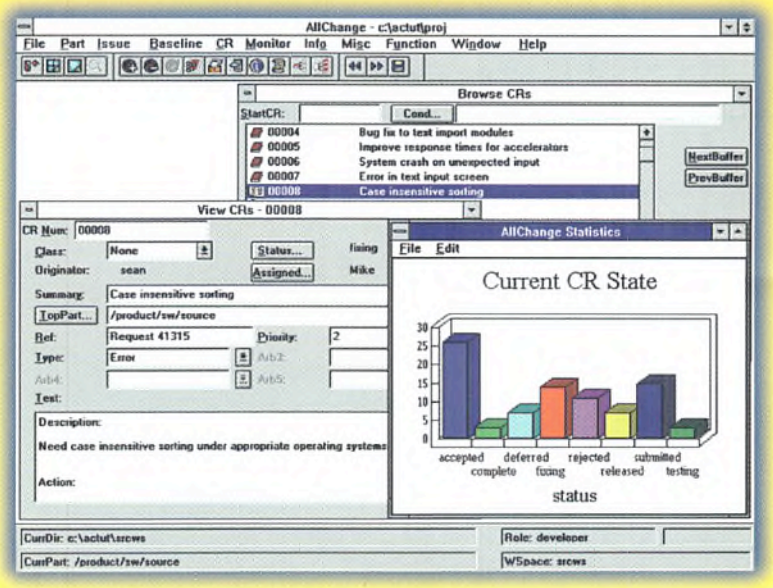

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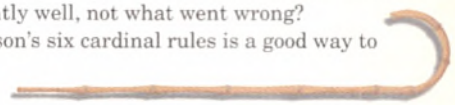

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SoapFlakes

Shrink wrapped software

I recently bought the Corel Draw 6 package to go with my brand new NT machine. I've had oodles of problems getting conversant with the software, largely because it is so poorly documented. The box of four CDs comes with a tutorial guide explaining how to generate some graphics, but the guide is mostly prescriptive, not descriptive. It tells me what to do, but fails to explain why I am doing it. After working through the tutorials, and failing in some cases to obtain the same result as the tutorial, I moved on to do the work for which I bought the package.

At that point I discovered I was intended to learn the programs through the on-line help. It is full of supposedly invaluable prescriptions, which go along the lines of: *to put the hat on your head, first take the hat and then put it on your head*. In general I need to know much more. What is the hat? I often need to know what the head is. Usually, I need to know why I should put the hat on my head in the first place. The help information is fine, but only if you understand the thinking behind the program, know the right keywords, and need a quick reminder of 'how do I do that'. It is able to help, but not able to teach.

I felt I didn't have to sit and suffer in silence. I had documented my problems, and decided to send some text to the Corel email address that appears in the tutorial book. I spent considerable time creating a file to send, including all the problems I'd had with the tutorial. I reported the details of problems with NT 4.0 Beta 1, and made some screen capture bitmaps to highlight what was apparently not working. I placed them on my anonymous FTP site. Maybe my experiences could help Corel to improve things, I thought.

I sent the email and was greeted by an instant bounce. It said: 'Great News!! We are now offering customer service through our Web site'. Fantastic. The site has a CGI form, but the Corel Web designers clearly don't want me sending 8 KB of mail through it. I tried. It died. I tried again. It died again.

I was cross. Suddenly the Web is a way for companies to become less responsive to customers. I printed the bounced email out and faxed it, addressed to the 'President/CEO of Corel'. No response. A week later I printed the text, searched out the CEO's name so I could send it to him personally, and placed it in the post. I still have had no response.

I've found that Corel generates products that crash a crucial part of the operating system of my computer. The programs seem able to kill the Win32 subsystem, leaving me no option but to power cycle the machine. The products are supplied with out-of-date and incomplete documentation. The online tutorial for Corel Draw is different from the one in the book, and the printed version doesn't work. Corel sees this as a way of shipping me brand new software; I see it as a way for Corel to off-load old, unusable manuals. Worse, the company is completely unresponsive when a customer criticises its products.

There's a lesson for developers here – for it is not just Corel that is obfuscating the learning process with arcane, limited, outdated, or simply useless help and manuals. It's easy to generate help text that gives a list of instructions on how to work the GUI, but customers actually want to know what is happening behind the front-end. We want to know the mindset of how the program was designed, and how the developers intended it to be used. Sadly many help systems describe only the choice of actions, and not what the actions actually do. These days it seems users are supposed to waste their time poking at the package to learn how its supposed to operate.

I said in all my letters to Corel 'you are in a very monopolistic position, and like most people in the PC software market, you can afford not to be responsive to complaints'. This seems to be oh so true.

Peter Collinson

Media myths

In the past few months many articles have been published on hackers. In July with the Access All Areas conference (where two ex-*EXE* staffers were speakers) most dailies had coverage of all the horror stories often attributed to hackers. Imagine for one second what would happen if *software developers* were in the limelight.

'Shock! Horror! After BSE the software glitch may destroy our agricultural industry. An unnamed farmer has revealed that a software fault in the milking machine resulted in harm to the animals. The RSPCA intends to sue the software developers involved. The BCS is also under attack from both sides. Farmers and the RSPCA claim that the BCS has a duty to check the quality of all UK software while developers and software houses would want the BCS to provide a fund to help them fight legal issues.' Is such a story that farfetched? After all some newspapers have had reports about hackers from the USA and Russia threatening the City with electromagnetic guns! And this was not on a fiction page.

Let's go one step further. The 'Computer Misprogramming Act' has been passed. Developers have to go underground in fear that one of their creation may not behave exactly as end-users expect. Will a good solicitor manage to get one of his clients out of trouble by claiming he was 'addicted to software development'? Journalists learn to program in order to research some articles undercover. A front-page story is immediately forgotten when other journos realise that the developer involved is *one of them*.

One presentation at Access All Areas II, by Dan O'Brien, was titled 'Hacking the media'. The techniques described could be as appropriate for software developers as they are for hackers...

David Mery

Mayhem!

Business people can use the Web for a lot of things,but asking **Jules May** to replace a missing grunion trinkler goes too far.

The trouble with the Internet, and in particular with the World Wide Web, is that the only people who know how to use it are, well, the people who know how to use it. In order to get connected and publish original material, someone who buys a computer in a box from Dixons must master so many new concepts that only the most determined aren't put off right away.

People are trying, though. I've set up about half a dozen machines for friends who wanted either to surf or to advertise their wares, and most have had some success. What prompted them to get involved was not a love of computers. It was all the *http://* addresses they were seeing in TV ads, and the fact that they knew someone who, undeterred by the chorus of snores and the rapidly retreating backs, had been talking about this stuff for years.

I've connected a whole range of people from plumbers to drink wholesalers. Most had few expectations of what they wanted to accomplish, so most were pretty satisfied when I asked them how they were getting on. I had a rather more clear idea of what I wanted when I started publishing, though, and I'm not so happy.

You may know that, alongside my programming, I also run a company that makes accessories for motorbikes (see *Mayhems passim* for the story of how I got into that). Wandering around (excuse me, 'surfing' – it sounds so much more intentional) I found a lot of bike stuff all over the Web. Although it's mostly small-scale enthusiast stuff, there is a definite presence, and a real dialogue going on. I decided to make a home page for my company and put technical support for one of my products on it.

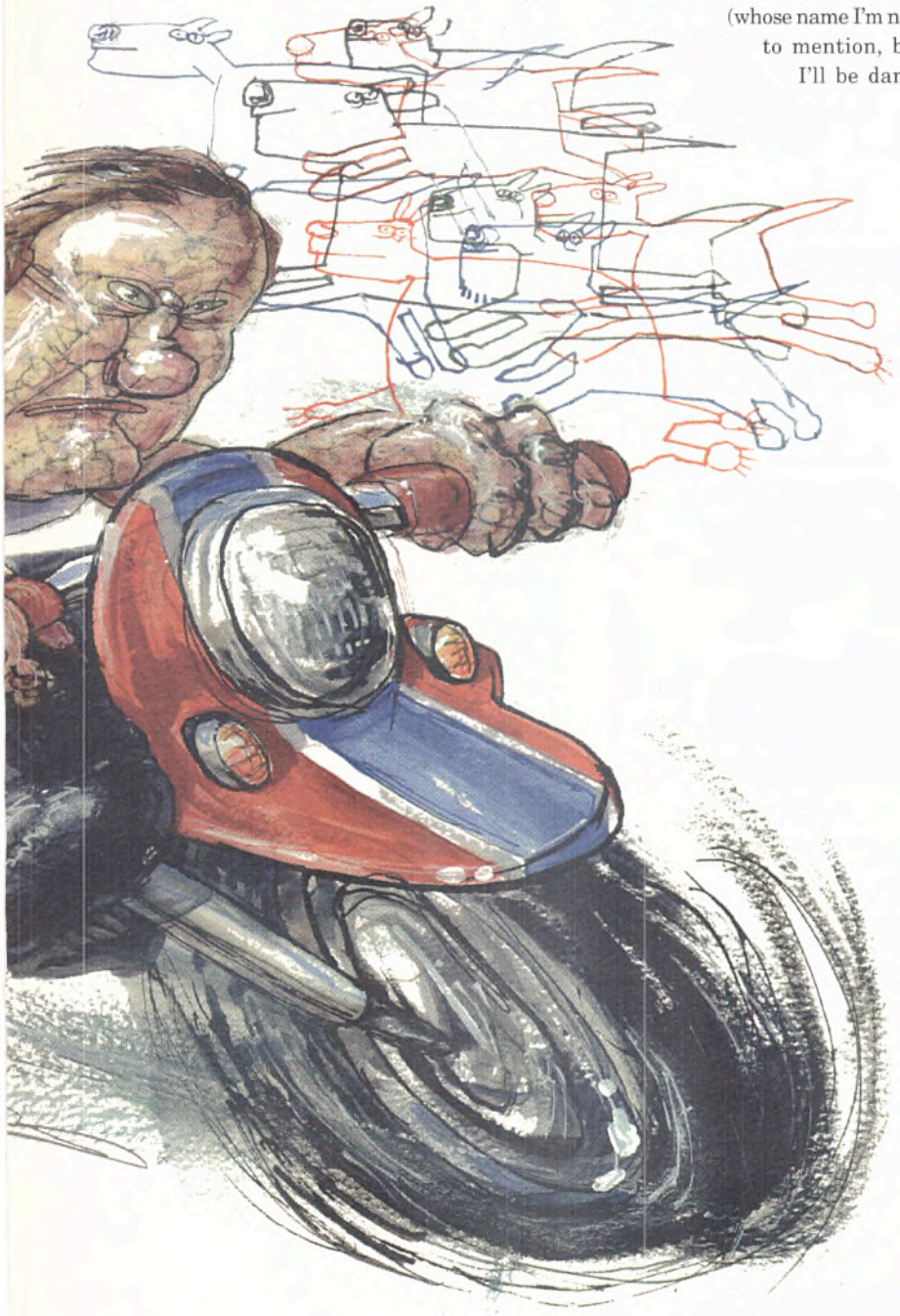
I worked hard on the page. I looked at what other people were doing, I read the style guides, and I made sure my page wouldn't be confusing. After seeing some of the over-designed pages the image-based companies (like the film distributors) put out, and having waited for hours for their pages to download, I kept mine simple. In short, nothing spectacular, but pretty in its

own concise way. I placed a reference in some indexes, persuaded a few other people to make links to my page, and waited to see what would happen.

A few people used the page for the purpose I intended, a few signed the visitors book, and a few sent me mail about the content. But the overwhelming majority of the contacts I received fell into two categories.

First was the Americans. They saw the home page (which contains my mailing address), and went no further. They fired off mail right away, asking things like 'Do you have a grunion trinkler for a 1932 Mainwaring and Smythe Cyclone model B? Preferably in red'. I received stacks of them – two or three per week, all from Americans. At one level this might have been very useful; had I any idea what a grunion trinkler was, had I ever heard of Mainwaring and Smythe, I guess I could have got a successful company going, because there's evidently a demand for these things. The point is, though, that these people had looked in the indexes for 'Motorcycles' and 'UK', found me, and didn't even care what I'd put on my page, so eager were they to find that elusive grunion trinkler. All my work was wasted.

But by far the largest quantity of mail came from companies offering Internet services. 'Would you like your very own website?' trumpeted one. Gentlemen, let me explain something to you: you got my address from a WWW index; you know perfectly well I've got one. Why would I want another? And why on earth would I want another at the ridiculous fees you are charging? Another offered to list my site in all the indexes known to it, for a one-time fee of $500 (that's right, five hundred bucks). One site (whose name I'm not going to mention, because I'll be damned if I'm going to give them the free publicity) regularly sends me 30 KB 'press releases' telling me only that trillions of companies have availed themselves of their services. At the last count half of all the world's corner shops must be using it.



I've been using network communications for a long time, and found it very useful in my business, so I was not one of those people who were deploring the migration of big business to the Internet, depriving the amateurs who really know how to use it (and who built it, after all) of their birthright. On the contrary, I believe in business, and I welcome a certain degree of professionalism. But something has gone very wrong here. Instead of business talking to business about their business, business talks to business about the 'net.

Imagine, if you will, the same situation applied to telephones. 'We can fill in all the forms for you to get some phones from BT, we can choose what colour each of your phones should be, and we can tell you where each one should go. We'll charge a stratospheric fee for doing it, and we'll do the whole thing over the phone. Just call 0898 xxxxxx. Oh, by the way, we're calling you reverse charge from Liechtenstein'. A company like this would be ignored at best, and pilloried at worst.

Instead of these idiot companies paying to tell me about their products, or even sending me a subtle little announcement to check out their own pages, they bombard me with mail which I have to pay to read. If they're mailbombing me, it's reasonable to assume they're mailbombing at least 40 million other sites, at negligible cost to themselves. This abuses the system. Worse, though, is that while these people are holding themselves out as experts and consultants, their knowledge of Internet communications must be limited, since they undermine the whole *raison d'être* of the Web by clogging up bandwidth with junk mail, rather than simply telling me their home page address. They are setting a bad example to the novices whom they are trying to exploit.

Forget hackers – if the Internet is to become sufficiently hardened to achieve its potential and persuade the bike, booze, and plumbing companies to join in, it needs to protect those companies against carpetbaggers. ■

Jules can be contacted on 01707 662698, or on Cix as jules@cix.compulink.co.uk. It is left as an exercise for the reader to find his web page. If, having found it, you think you could do a better job (for a fee), or you want it to be on your server, or you just want to tell him how great you think you are for knowing 273 different smileys, take a cold shower.

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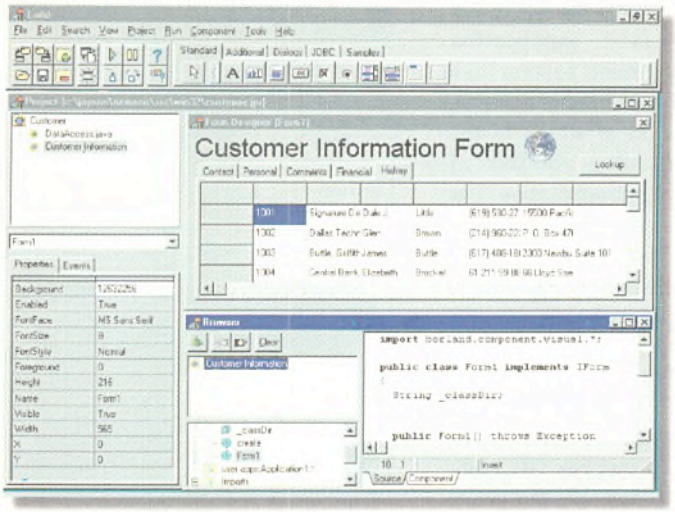
CIRCLE NO. 737

When is a Delphi not a Delphi? When it's a Latté

Eagle-eyed readers who are thinking that we've confused our screenshots and printed one of Borland's Delphi should look a little closer. The product shown here *is* Borland's forthcoming Latté product for Java. Unsurprisingly, it looks and feels very much like Delphi 2.0, with a few extensions to the user interface (for example, the project tree view appended to the properties sheet).



Both Microsoft and Borland appear to be basing their new Java products on tried and tested technology rather than any radical new interface: Jakarta, the Microsoft visual Java tool, is based on VisualC++ technology, and early alpha versions ran within the Developer Studio environment as a slightly modified Visual C++ 4.0. However, Latté, with its Delphi heritage, seems to be more RAD-focused than Jakarta.

Although still in alpha (with a beta version predicted later this month or early next, according to Jack Oswald, Borland's Internet/Intranet marketing manager), the product is already attracting much interest among the Delphi and Visual Basic communities. The visual UI builder is not limited to the standard AWT Java classes: Oswald indicated that Borland intends to support Java VCLs (Visual Component Libraries, the Borland equivalent of an OCX) and any further enhancements to Java's native control set. Latté will feature Borland's AppAccelerator just-in-time compiler for Java, and will be able to build both stand-alone applications and web-page applets.

Like Delphi 2.0, Latté will come in Standard and Client/Server flavours, the latter with a full set of integration tools and JDBC compatibility.

Borland: tel 01734 320022

Take the spines out of client/server with Cactus

Do you need to develop three-tier client/server applications across the Web? Information Builders thinks it has the solution with its new product, Cactus. One of the first client/server development and middleware products to target exclusively the Web, it is claimed to be able not only to build new applications, but to upgrade existing ones. ActiveX Coupling makes Cactus work with traditional two-tier OLE-enabled environments like Visual Basic or Delphi: back-end transactions are handled by the Cactus software which effectively adds on the third tier.

Information Builders says that Cactus 'requires no prior knowledge of HTML, Java, 3GLs or CGI'. Applications are built within the Cactus Workbench, a visual drag-and-drop development environment, and generated into Cactus' own language. At the server side the product can directly access 65 different database formats, while on the client side all Cactus applications are targeted at standard Web browsers.

Cactus is available for Windows 3.x, 95, NT and OS/2 Warp. Server support on Unix is provided through EDA and the Cactus Server software. For UK pricing information, contact Information Builders direct.

Information Builders: 0181 982 4700

Cyrano: not just a big nose...

French company IMM, which recently set up a UK subsidiary, has released the second version of Cyrano Suite, a diagnostic and performance-enhancing system for Sybase and Microsoft SQL Server database applications. According to IMM, up to 80% of a given application's performance rests not on the standard of hardware on which it runs but on the internal efficiency of the code itself. Cyrano consists of four major components: Cyrano Workbench, which analyses transactions and identifies bottlenecks, Cyrano Production which visually identifies the defective transactions and keeps a record of the system state over time, Cyrano Watcher, which compiles a broad variety of statistical information into a separate database for later analysis, and Cyrano Insight, which traps APIs and intercepts the faulty code.

Cyrano Suite is targeted at database development both before and after initial implementation. Training and initial analysis of a client's systems by an IMM consultant is a standard part of the package. For more information, including pricing, contact IMM directly.

Telephone IMM on 01635 32503 *Fax 01635 31638*

NEWS

Rational Software and Forte intend to integrate their **Rational Rose** and **Forte Application Environment** products. The combined product, to be known as Rational Rose/Forte, should be available by December 1996. Contact Rational Software: 01273 624814

Informix Embedded SQL for C 7.10 (ESQL/C) is available under **Windows NT** 3.51 on **PowerPC**. OnLine Dynamic Server 7.12 is to follow shortly. The port has been achieved together with PowerPC manufacturer **Motorola**. Price TBA. Motorola: 01628 39121

It's official! **Jakarta** is no more. **Microsoft**'s forthcoming **Java** development system has changed name to **Visual J++**. Developers can **download** a free (and huge) copy of the oddly-named **beta** from www.microsoft.com/visualj, or order the beta on **CD** by calling 01734 270001

Engineers and scientists using **Matlab**, the **statistics** package from MathWorks, can add over **200** calculation and GUI presentation functions to their existing copy of the software with the Matlab Statistics Toolbox. Available for PC and Mac, price £350. Call 01223 423200

Embedded experts IAR Systems has the **ICC7700 Workbench** and **C-Spy 7700 Debugger** for the **Mitsubishi MELPS 7700** family of controllers. ICC7700 incorporates a full C development kit and runs on the PC under **DOS**. Call 01703 229041

- Grey Matter is launching Blue Sky's **Visual SQL** in the UK. It integrates with **Microsoft Visual C++** to turn it into a **client/server development environment**. Price £990. Interested developers can get more information from Grey Matter on 01364 654100.

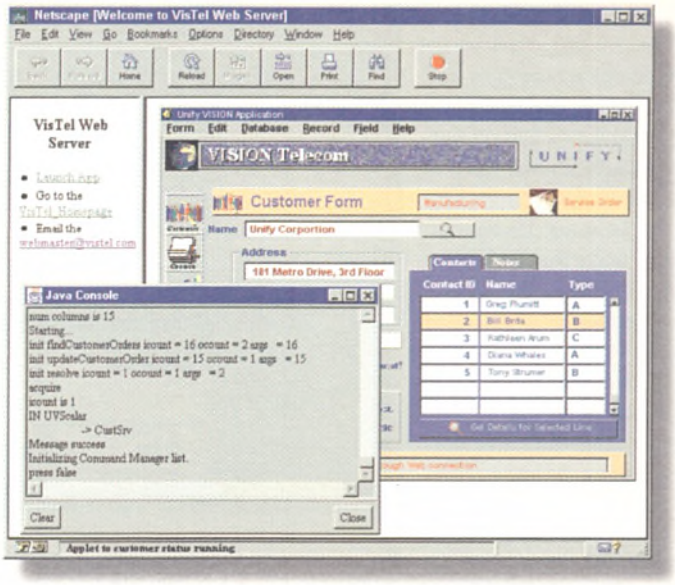
- **WebXpresso** from DataViews is a new standard for **interactive Web graphics** which works by way of a Netscape plug-in or ActiveX control. A **Java** version is planned. A **developer kit** for building WebXpresso plug-ins and content can be obtained from Dataviews. Call 01276 686828.

- **Apilink/Web** is an extension for accessing multiple-standard **databases** across a **Web** connection. It extends the existing Apilink software which supports a wide variety of **client platforms**. A number of databases are catered for. Call 01344 382028.

- It's possible to access **NetWare** services, including **NDS**, in full **32-bit mode** from **16-bit** DOS/Windows 3.x platforms, courtesy of **Client32** from Novell. Download it free from *http://netwire.novell.com/home/client/client32*.

- Complex datasets can be converted easily into intuitive **2D** and **3D** images with **AVS/Express** from Advanced Visual Systems. These **imaging** facilities can then be built into applications working against Oracle, Sybase and Informix databases. Call 01932 566608.

A new Vision of the Web



The latest release of the Vision application development system has added a number of features, not least of which is the much-touted addition of 'real' object-orientation. The OO features of Vision 3.0 centre around a graphical class browser, which it is claimed makes it easy for programmers with little or no OO experience to build an OO Vision application. Unify stresses that Vision doesn't enforce OO techniques, and that the procedural programmer is adequately catered for. Support for OLE Automation and OLE containers, DB/2, and Year 2000-compliant date handling has been incorporated.

A companion product to this release, entitled Vision/Web, was announced at the same time. Unlike tools specifically designed for building Web client/server applications, Vision/Web integrates with the code-generation unit of Vision 3.0 and adds Java capabilities. Any Vision project can be automatically converted into Java code, which runs with an identical look-and-feel in the Web browser environment.

The product is expected to ship in August, at $9,300 per developer, while Vision/Web will be available for a one-time cost of $22,100 per development site. Run-time licenses are priced at $390 per user.

Unify: 01784 484000 *Fax 01784 484044*

Client/server RAD with Intra

Borland recently previewed Intra, designed to enable rapid development of Intranet client/server applications. The product works through JavaScript and the Intra middleware which interfaces with a variety of server-side databases, including Borland's own InterBase. The development portion of the product consists of a visual interface builder and JavaScript generator; there will be no built-in way to edit the JavaScript code manually, however, and no support for Java itself. Borland clearly believes that there is a large market for an easy-to-use, scaleable development solution for the Intranet, and that the Web browser client is the way to go, with Delphi or Latté for projects where there is need for a custom client.

Borland: tel 01734 320022

Continuus checks in version 4.1

Like it or not, version control and change management (CM) is an essential requirement for medium-to-large size development teams. There is much interest of late in the complex fully-featured change management solutions. Continuus believes that the version 4.1 of its eponymous package will convert significantly more developers to its point of view.

Additions to the current version include client support for Windows 3.x and Windows 95/NT 3.51 – and downloadable components which support the development of Web and Intranet sites as well as traditional code-base development projects. The back-end software runs only on Unix at the moment; a Windows NT-hosted server side is not currently planned.

Like most competitive products, Continuus works on the principle of checking in and checking out modules of code. In this way the system knows who is working on what and when. The build manager can set schedules and assignments for developers in his team, and where more than one has amended a code module since it was last approved can choose which revisions to accept, reject, or merge.

With the aim of reducing the intrusiveness of CM software, Continuus 4.1 interfaces directly with the Microsoft Developer Studio in Visual C++ 4.x. It integrates with the development environment to make the process of checking out code and tracing revisions as seamless as possible. Similar support for other environments such as Borland C++ 5.0 may be forthcoming, but the company would not make any commitments on this point.

The application of CM software to Web site development is a new one, but in the light of the amount of work, often done in teams under the supervision of a Webmaster which goes into many of the larger commercial sites, it may open up a significant market for this kind of tool.

Continuus is on 01344 382118 *Fax 01344 382158*

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Btrieve 6.15 for Netware, Windows, 3.1, NT and 95 is the de-facto standard database used by developers working with 3rd, 4th or 5th generation languages to build mission critical client/server applications. Features include multi-tasking, registry support, dynamic file expansion, true WinDLL requesters, dual mode requesters (NT and Netware), improved memory use, SFT III support, and more... Btrieve Developers Kits for Win, Win 95/NT & DOS are available. **from £345**

Optima++

Optima++ Developer is the first RAD tool to combine the power of an industry standard O-O language, C++, with the productivity of a component-centric client/server and Internet development environment. Includes a built-in copy of 32-bit Sybase SQL Anywhere RDBMS. OCXs are automatically integrated, and accessed with drag-and-drop programming, dynamically generated wizards, and online reference information. **£139**

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MKS Toolkit ver 5.1

MKS Toolkit gives Windows NT3.5+ and Windows 95 developers a full suite of powerful UNIX tools including KornShell, awk, awkc, vi and visual diff for Windows, make, a windows scheduler, grep, sed, tar, cpio, and pax - more than 190 utilities and cammands for performing a variety of computing tasks, with support for NT & 95 long filename. For Win 95 & NT–Intel, Alpha, Mips on one CD. **£239**

Borland C++ 5.0 Dev. Suite

The Ultimate in Programming Power. New Borland C++ Development Suite for Win95 /NT saves developer time with five essential tools useful from coding to installation. Edit/compile/debug 32- and 16-bit code, automatically detect bugs, use version control, compile and debug Java Apps and use App Accelerator to speed Java Apps. **£315**

BoundsChecker Professional

BoundsChecker Professional redefines automatic error detection for C/C++ developers using Windows 95 or NT. Professional Edition has breakthrough technologies to capture even more information, with extended API compliance checking. Integration into the VC++ environment, enables BoundsChecker to be used at all stages of development. ***New version 4.0*** has Delphi 2 support and many new features. **from £235**–PS Soft-ICE/NT now shipping. **£525**

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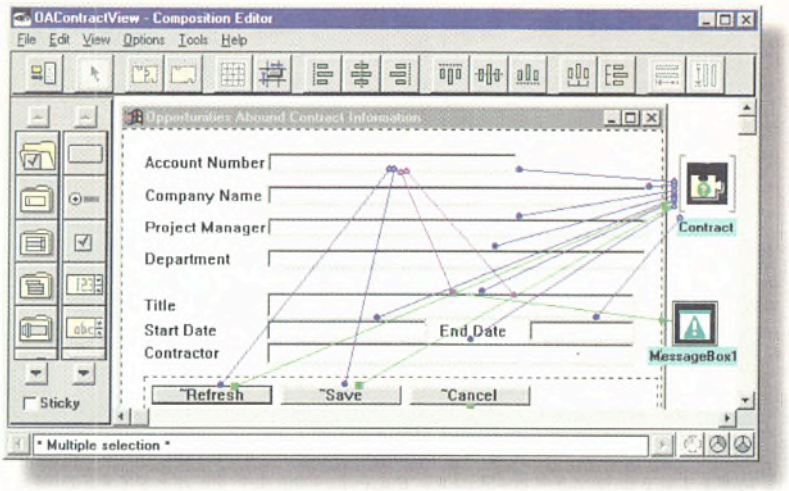
CIRCLE NO. 738

IBM heralds the dawn of a Visual Age for C++ and Java



IBM announced Visual Age C++, available simultaneously on Windows (16- and 32-bit) and OS/2, which brings the 'join the dots' programming philosophy first seen in Visual Age Smalltalk to C++. Unlike traditional command-line or more modern 'visual' environments, Visual Age programming consists of linking together 'parts' such as buttons and controls on dialogs with pre-written or developer-written blocks of code. Making a link is achieved by simply drawing a line on-screen between the two components. IBM has stressed that the product doesn't entirely remove the need to write code – the core functionality of any application can very rarely be expressed with off-the-shelf components – and that Visual Age C++ can greatly speed development of those parts such as user interface for which pre-defined parts exist.

Hot on the heels of the C++ version, IBM has previewed Visual Age Java (as reported in *EXE*, June 1996, p.16). This product will be identical to the C++ version except for those restrictions imposed by the limited spread of controls provided by Java's AWT classes, and will feature an IBM-written Java compiler and Just-in-time compiler (including a Windows 16-bit version). This product should be available on the same platforms as Visual Age C++ 'before the end of the year'. Pricing for Visual Age C++ starts at £311, with a competitive upgrade price of £132.

- *IBM is on 0181 818 4000*
- *Fax 0181 818 5499*

Develop cleaner code with Purify NT

Unix developers have long had the use of Purify, an error-detecting package which tracks memory leaks and finds obscure defects. Although different from a traditional debugger, Purify has gained a place in many programmers toolboxes. Now NT developers can use it too with the release of Purify NT. Maker Pure Software claims that Purify doesn't need access to source code to provide meaningful results, which makes it far easier to debug third-party code. In fact, one of the strengths of the product is that it can check for memory leaks or other errors throughout the scope of an application, including bought-in libraries and optional components. This is achieved through run-time patching of the code (which Pure Software terms Object Code Insertion): breakpoints are inserted before and after every memory access, and all memory operations are supervised and checked as they happen. Should any operation fail unexpectedly, Purify flags an error and gives full information about the state of the process at that time. The software can also cope with multiple threads of execution and across multiple processes.

- UK pricing for Purify NT is £370
- A subscription including upgrades starts at £560.
- *Pure Software: tel 01734 880226*

A new Clarion call for Windows RAD

Version 2.0 of TopSpeed's widely-respected client/server development system, Clarion, has been released under the banner of Sapphire Software in the UK. In particular, the Clarion 4GL has been upgraded with OOP features, and OLE support has been added, along with greater customisability for the application user interface.

The OO extensions to the Clarion language have been implemented in such a way as to make them optional rather than necessary, in order to minimise disruption to experienced Clarion developers who would rather stick with the older syntax. This version will still build code for 16- and 32-bit Windows platforms, with development environments, tools and libraries for both in the same package.

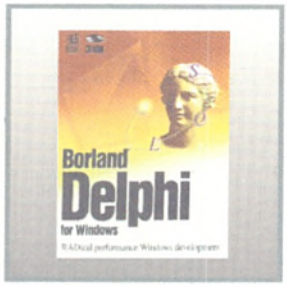
Version 2.0 will ship in three editions: Professional, for individual developers, priced at £480.58, with Enterprise and Standard editions due later in the year. In the UK, Clarion 2.0 will form part of the Sapphire Database Choice range of products.

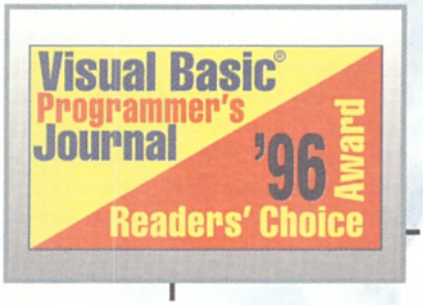
- *Sapphire: tel 0181 554 0582*
- *Fax 0181 518 4150*

NEWS

- **Internet Directory Access Kit** from Isocor is the first **LDAP** implementation for Windows NT which supports both **ODBC** and **Jet** APIs. Applications built with the kit can work against any ODBC-compliant database and add in standard Internet **TCP/IP** functionality. POA. 0181 758 2521
- Building C++ applications should be easier with **Object Partner**, an **OMT**-compliant modelling and code-generation tool from Verilog. Apparently, it can reverse engineer applications back into a model **without** access to source code. POA. 01494 465907
- Tuning **SQL** databases on **DB2** is made simpler by **Apptune** from BMC Software. Apptune seeks out inefficient SQL code across multiple subsystems and improve performance by as much as **97%**. Price TBA. To find out more, call 01276 24622
- Release 7.0 of **Open M**, the client/server development system for transaction processing, will be available on Windows NT and 95 for the first time. Open M supports **single**, **two** and **three-tier** applications across multiple platforms. 01753 855450
- VAPS is an **object-oriented** visual GUI builder from **VPI**. It generates C source code which includes all the **primitive** drawing functions and so can be easily **ported** across platforms. It is particularly suited to **embedded** applications. Reflex is on 01494 465907

Now includes unlimited application license!





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Compuserve: 100637,3301

- Developers using the **Prolog**-based Amzi Logic Server can embed Logic Server **agents** and **components** into **Java** programs using the Java Class developed by the company. The developers kit includes the **Sun JDK** and prices start at $298. 00 1 508 897 2784

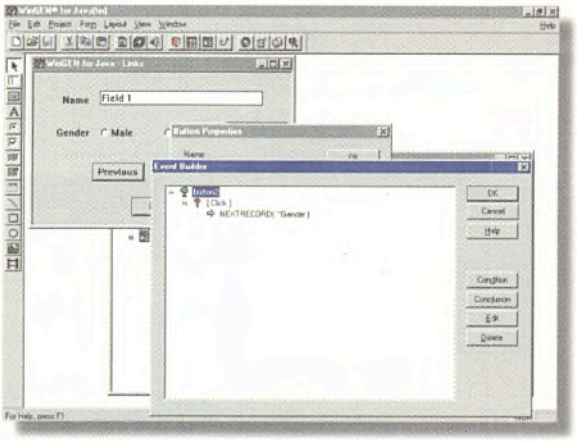
- Embedded system developers who want to add support for their platforms to Wind River's **Tornado** C development environment can use the Back End Developer's Kit to do just that. The kit exploits Tornado's **Tcl** architecture to plug in extra support. 0121 359 0981

- InterMart Toolkit is a **Web-to-SQL** tool, but with a subtle twist. It automatically turns **query** results into HTML pages and vice-versa, and end-users can refine their search by clicking on **hyperlinks** rather than having to know SQL syntax. A full developers kit is available from NetScheme at $695 per server. 00 1 508 480 0877

- Microsoft has revealed that its **Nashville** technology, widely rumoured to be **Windows 97**, will in fact become **Internet Explorer 4.0**. The Nashville components will patch into Windows 95 and NT and merge Internet Explorer with the desktop. Expect more details on this soon.

- Object database specialist O_2 Technology has announced a set of **persistence** tools for Java developers to interface to **ODMG**-compliant databases. The O_2 Java Suite supports relational **JDBC** interfaces. Call 01403 211020

WinGen: the quickest way to a good cup of Java?



The Java development market is exploding, but there is still room to get in on the act. The latest tool from Pro-C, WinGen for Java, is just such an attempt. Billed as a Java source code generator rather than a full development kit, WinGen tackles products such as Rogue Wave's JFactory head-on.

One unique feature of the product is its Event Builder. Unlike traditional RAD, where developers are left to code the 'glue' logic by hand, WinGen can build up event handling code graphically, by selecting and listing the operations to carry out. The actual Java code is generated from this graphical plan.

Pro-C is targeting WinGen at both 'first time users' and 'experienced developers'. Many code generators are unsuitable because they will simply override anything added in by the developer, but WinGen provides markers in the source called CodeHooks: anything added within them is left alone when the source is regenerated. This is intended to strike the right balance between automation and flexibility.

Compared to JFactory, WinGen is considerably cheaper, at £294. However, with more fully-featured products such as Latté or Visual Café on the way, and likely to retail for considerably less, it remains to be seen what niche products like WinGen may carve.

For further information contact UK distributor Grey Matter on 01364 654100

Java that's Eleven times better with Galaxy?

One of the principal reasons Java objectors hold out for not jumping on the bandwagon is that applets and applications written in it have a relatively poor user interface. Visix Corporation thinks it has the answer in a new Java application development tool called Eleven. Designed from the ground up for building *applications* and not *applets*, this product incorporates of a new Java Virtual Machine (JVM) implementation, built around Visix's successful Galaxy application framework.

The modified JVM contains the existing Galaxy C++ classes which provide fairly rich and high-level functions: controls from all supported platforms have been implemented within the Galaxy classes. This implies that Java applications built with Eleven will immediately gain a full set of widgets, controls and application-level functions which overcome many of the existing drawbacks of the language as it stands today.

To run applications build with Eleven, the target computer will need a copy of the appropriate IAP (Intranet Application Platform) which incorporates the new JVM and Galaxy classes. Eleven applications can also be run within the browser environment using a plug-in or ActiveX control supplied by Visix.

A trial version of Eleven is available on the Visix web site, *http://www.visix.com*. General availability should be in 'quarter four 1996'. No UK pricing has yet been announced.

Visix is on 0171 872 5825 *fax 0171 753 2720*

Spinning miniature Webs with PharLap

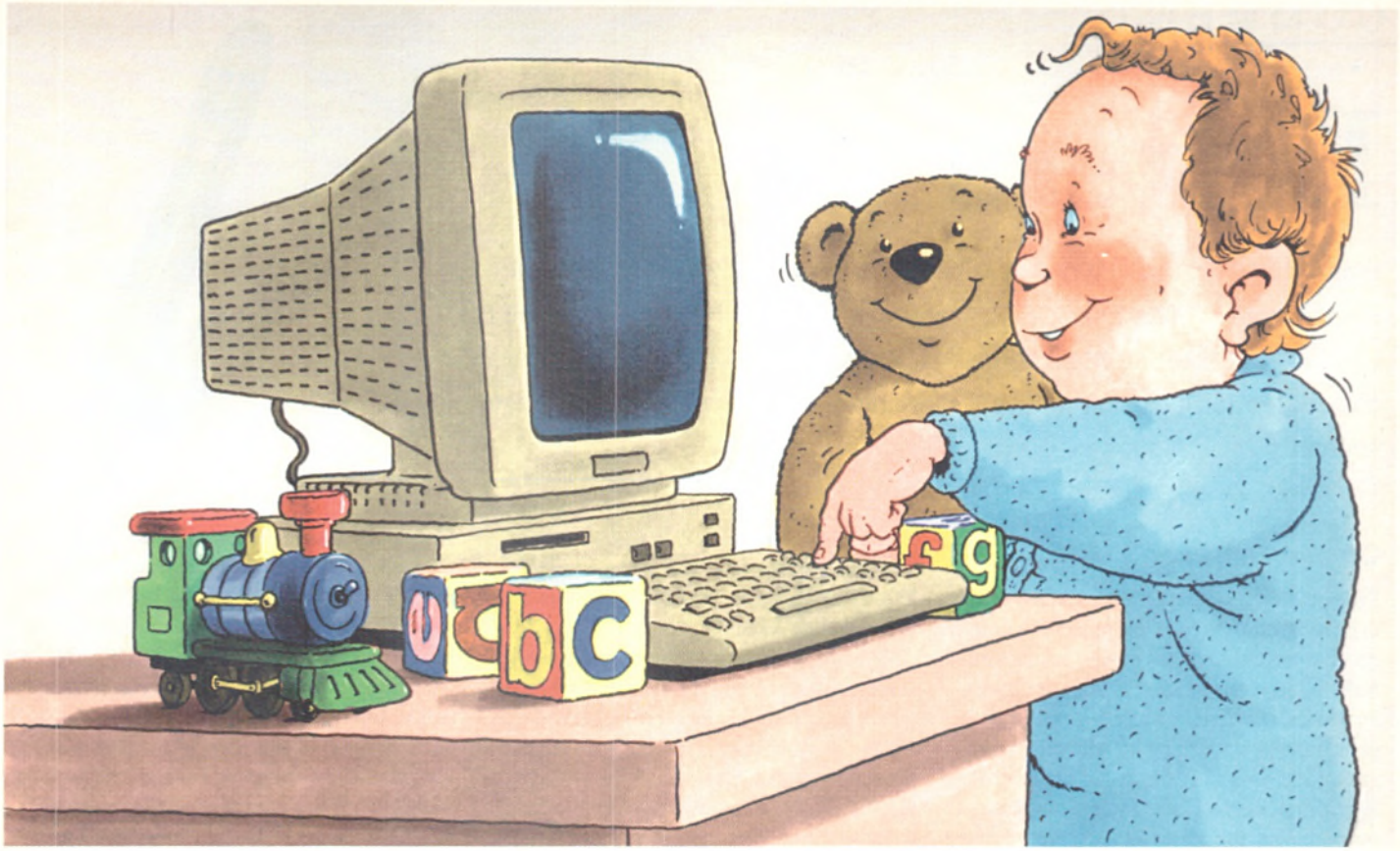
Embedded systems developers who've been waiting for a chance to put up a Web site on a dishwasher have been given new hope by PharLap, whose latest venture is what it proudly trumpets to be 'the world's smallest Web server'. Based on its existing Embedded Web technology, the server is small enough to run on a 4" square single-board 386 under PharLap's Realtime ETS kernel for x86 embedded development.

The server incorporates full TCP/IP support and an HTML generator which receives output from the embedded device and converts it on-the-fly into HTML pages which can then be accessed externally by any device connected to it over local or wide-area networks.

The idea is that traditionally dumb devices such as sensors, heating systems, photocopiers and remote weather stations can be constructed around this technology and then queried or controlled from any Web browser-equipped PC. The notion of consumer devices such as microwave ovens which can give advice on cooking time or recipes over a Web link may not be too far ahead!

All the developer tools for these applications will be in Version 8.5 of the TNT Embedded ToolSuite Realtime Edition, including the HTML generator, TCP/IP, and SLIP/PPP dialup software. It will be available in the second half of 1996. In the meantime, you can see a demo of the world's smallest Web server running on a remote weather station at *http://smallest.pharlap.com*.

** PharLap: tel 00 1 617 661 1510*



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Millions of pounds is lost every year through the mis-use of software and even piracy. Policing of the industry is difficult, and sometimes ineffective or non-existent abroad. Therefore the emphasis falls on you to protect your own investment. You need to create and distribute more secure software products.

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Letters

We welcome short letters on any subject relevant to software development. Please write to: The Editor, *EXE Magazine*, St. Giles House, 50 Poland St, London W1V 4AX, or email **editorial@dotexe.demon.co.uk**. Your letter will be considered for inclusion unless it is marked 'not for publication'. Letters may be edited.

On penmanship

I've never been too happy with your decision to have 'hand-written' code snippets in Francis Glassborow's articles (I was puzzled initially by my own unease, then it twigged – I've never, ever, written any real code with a pen), but was prepared to tolerate it as someone else's personal aesthetic preference. However, it now seems that the artistic overtones are having a baleful influence on the code content – see the July problem code line `reading #include <studio.h>`!

Seriously, if Francis (or anyone else) really is writing code by hand, he is making it that much more difficult for himself to use an excellent piece of software to catch sillies like this. It's readily available to all working programmers and beats the pants off the spelling/grammar/style checkers in even the best WP or DTP packages. It's called a compiler. *Robert Sproat*
London

The style choice for code snippets in Francis Glassborow's column has received mixed reactions. For every deploring comment like this, at least one reader tells me how much he likes the hand-written lettering. I've decided to let all readers have their say: visit *EXE OnLine* (*http://www.exe.co.uk*), and place your vote. The United Nations won't be around to monitor, so I cannot guarantee that democracy will prevail, but I would like to hear everyone's view. – *Ed*

A whiff of dissent

Please ask Jules May to get his facts right before making sweeping accusations. His statement that my critique of falsificationism is 'the first whiff of dissent since the decline of creationism' betrays a severe ignorance of the history of thought.

Newton's theory of gravity was falsified soon after it was produced – based on observations of the moon's orbit. If falsificationism ruled supreme, this extremely useful theory would have been rejected. It was not the theory that was wrong – the evidence used to 'falsify' it failed to take into account the effect of other factors.

Falsificationism assumes that truth of observations can be established absolutely, which is just as bogus as saying that the truth of a theory can be established absolutely. It took fifty years for the so-called 'falsification' of Newton's theory to be shown to be incorrect – fortunately, falsificationism had little impact on the application of this theory. The problems with falsificationism form the basis of my accusation of 'religious persuasion' – there is no logical or historical basis for viewing falsificationism as sacrosanct (as any student of philosophy knows) and therefore any zealous adherence to its principles is an act of faith, as countless other 'whiffs of dissent' have established.

On the issue of consciousness, Jules argues we need a 'definition' of consciousness to underpin social thought and legislation. He missed the point of my original letter – we get on perfectly well with an implicit, subjective understanding of consciousness, and our kack-handed attempts to deconstruct consciousness, if taken seriously, will confuse rather than improve. To return to philosophy, maybe if Jules takes consciousness (rather than falsificationism) to be axiomatic, he will see the wood, and not just the trees.

If Jules feels he must reply, please could he do some homework first. Otherwise, I look forward to seeing some letters about IT in these pages. *Rob Macdonald*
rob@isa.co.uk

Firstly, before you accuse me of deconstructing consciousness, perhaps you should go back to read the argument to this point. Secondly, I never demanded a 'definition' to underpin social thought, I asked for 'something'. Thirdly, your claim that any attempt to better understand consciousness will lead to confusion and contradiction may be true, but if so, shows that the ideas we currently use are not adequate to generalise to other consciousnesses should they ever arise. Whether you're right or wrong, research is surely justified.

This is not the place to argue philosophy, but I think you are having some difficulty with the idea of falsification, and the difference between it and refutation. Newton's laws of motion cannot be demonstrated to be absolutely true to the last decimal place in any laboratory, because external factors will always intrude. But we can minimise those factors, and as we do so the results we get approach those which are predicted by the theory. Newton's law of gravitation was a good theory precisely because it was falsifiable. Note that the anomalous results from observation did not constitute a refutation (if they did, the argument would have been over), and the theory survived to defend itself, not least because it was the best one going (ie the most easily falsified). As of now, science – particularly physics – has lots of anomalous results, but very few refutations.

I'm not demanding anything contentious like theoretical pluralism. If you're going to put words in my mouth like 'sacrosanct' or accuse me of 'zealous adherence' in asking for theories to be general, predictive, and leading to observation when you don't believe theories should be any such thing, I can see why you think I have a religious persuasion. But I don't think you believe those words. You're smart enough to understand the difference between faith and reason, you're smart enough to understand what a difference of opinion is, and you're smart enough not to have to score cheap points. *Jules May*

EXE* agrees with Mr Macdonald on one point: how about some letters about software development? – *Ed

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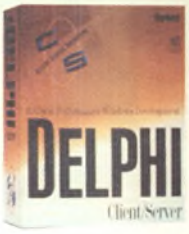

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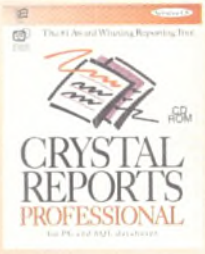

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Today's analysts and programmers live in a defective culture. The motto 'all software has bugs' dominates software development. Is your career on the skids because that critical report just would not print? Did all the footnotes in your new book disappear? Don't complain. Bugs are a fact of life.

What about replacement, bug-fixed software? *'Sorry, no chance. You can upgrade to the next release for £50, though. It will fix the old bugs (although we can't guarantee that), but it will certainly have fascinating new bugs of its own'.* You're getting angry now, so what about the Sale of Goods Act? Your wordprocessor lost you your annual bonus when it stuffed up that report, so it is hardly 'fit for its purpose'. *'Sorry, the Sale of Goods Act doesn't apply to software. I think you hire it instead of buying it or something. Anyway, we've got great lawyers and no one has dared take us to court over it'.*

On the whole it's hardly worthwhile buying this stuff then, is it? *'Hold on there, that sounds like piracy you're talking, and that's a crime. This software may not work properly – hell, all software has bugs – but by God you're not going to get out of paying for it'.*

At this stage you give up. You do need a working wordprocessor, so you'll pay for the upgrade. *'Great, you know it makes sense. Just one thing, the upgrade won't be available until next year, but you can come on the beta test program if you like. Just don't use it on any important data...'*

Increasingly we talk about software engineering instead of programming. Software developers think of themselves as software engineers, but I can't help feeling the 'all software has bugs' culture is a long way from an engineering discipline. An apocryphal story (which means I think it is true in essentials but I can't verify the references) says in the early days of computing a group of engineers taught themselves Fortran, then wrote a system to run an American utility company. Ten years later the system had not failed significantly. The company held a big party to celebrate. It gave each of the original engineers a gold watch and asked them 'How did you build that system so well? What methodology did you use? What can our current programmers learn from your techniques?'

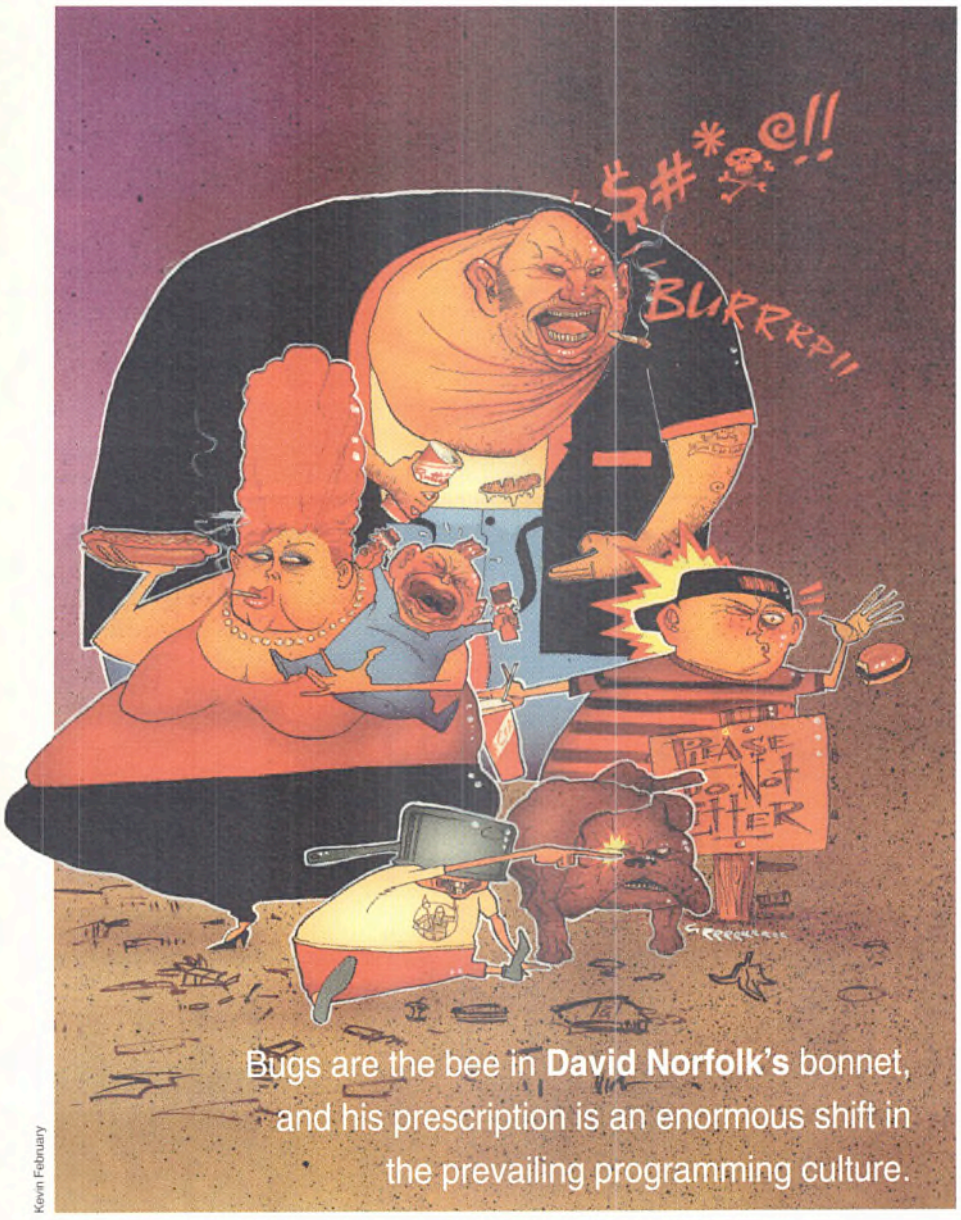
The chief engineer looked around sadly. 'Nothing,' he said, 'nothing at all. You see, the point is we weren't programmers. We were engineers. No one told us we were allowed to build it wrong'.

Staying in control

Even if it is allowed, you still don't have to build it wrong. Ways to control defects in software have been known for a long time, but they aren't used a lot on business systems. I'm not talking about the formal methods and 'provably correct modules' used in military and safety-critical systems, but more common techniques that anyone can use. I am certainly not talking about massive beta test programs either. I am talking about principles described as long ago as 1979 by an IBM systems engineer, Glenford Myers, in *The Art of Software Testing* (Wiley, ISBN 0-471-04328-1).

I don't apologise for bringing an ancient book into a modern magazine such as *EXE* because its ideas are challenging today *[it's an essential volume that has been mentioned here a few times – Ed]*. Many of the examples are in Cobol or Fortran, which can be hard on C programmers, but its most interesting ideas are expressed in plain English. The core of Myers' insight is his definition of testing itself: 'Testing is the process of executing a program with the intention of finding errors'. Following directly from this is the idea that any test run which doesn't encounter errors is *unsuccessful*, because it wasted resources. Consider your least favourite, most buggy software. It probably passed successfully through a test program before it shipped, but as it still contains defects those tests were actually unsuccessful, because the defects weren't exposed.

Testing comes down to psychological attitude and economics. Defects exist in programs because we put them there. We would rather run 30 tests which make us feel good about our program (by not finding defects) than one which exposes an error and reminds us that



Bugs are the bee in **David Norfolk's** bonnet, and his prescription is an enormous shift in the prevailing programming culture.

Kevin February

A def

we're fallible. But unfortunately the resources available for removing bugs are limited. If we squander them on making ourselves feel good, too few will remain to find any defects at all.

The most common way we put defects into our programs is poor analysis, so analysis should be tested throughout the project lifecycle. If you are building the wrong system, good coding isn't going to save it. It is also poor analysis to guess at some detail you forgot to ask the users about (because it will get sorted out during testing). In reality you will probably forget about that detail, and either way you've increased the resources needed for testing, which could mean other defects will be missed.

Amazingly, some employers actually reward people for putting in defects. I remember working in a bank where a project manager delivered zero-defect systems. He went home at 5 o'clock every day and was thought of as lazy. Real programmers slammed in the code during 16 hour days, often half-asleep, and came back in at 3am to fix resulting production problems. I don't think they got overtime (this was a bank) but they got lots of kudos and huge end-of-year bonuses – just because they fixed errors they shouldn't have made in the first place. The end-users were rather less complimentary about this second group, however. They preferred products delivered by the lazy man's team.

Figure 1 – A study commissioned by CenterLine Software, vendors of lifecycle automated testing tools, gives real food for thought. Almost half (47%) of respondents thought that their organisation didn't adequately test software before it was released.

Figure 2 – 57% of respondents to CenterLine's survey admitted that their organisation had knowingly shipped software with bugs in it.

Figure 3 – Centerline found that software developers have responsibility for ensuring quality in 84% of responding companies. However, in my opinion, 'third party' quality assurance teams are far more likely to have the unbiased viewpoint needed to really root out defects.

To beta or not to beta

In many software houses the beta test culture – based on rapid development, with the users left to find the errors during a massive test program – appears to have institutionalised poor quality. Developers cut corners to get the product built as rapidly as possible, and to get all the kudos of early delivery. The 'finished' application then goes to a hoard of beta testers charged with finding all remaining defects. The product is made generally available only when the beta testers stop complaining too much. Hopefully no one will think of it as late, or notice the defects still lurking.

Beta testing is a good way to check that the original need for the system still exists and whether the users can still get value out of it. However, if it is used as a way to find defects in a shoddy development – problems such as misconceptions about the business, coding errors, potential for system crashes, memory leaks, performance problems, and others which a lifecycle testing process should have found earlier – it can be a disaster. At best you won't find many errors because the testers avoid the areas which don't work (the beta test runs lots of almost duplicate tests, which is, as Myers points out, a waste of resources). If you are unlucky, fundamental design errors show up, or misconceptions about the requirements, and they won't be easy or cheap to fix. The more fundamental an error, the more expensive it is, which is why lifecycle testing is so important.

The easiest defect to deal with is the one you didn't make in the first place. A defect at the beginning of development can mean that the whole system is constructed on unsound foundations. The whole project should undergo a testing process, not just the final code. Start with the original problem definition – perhaps the manager who gave it to you doesn't realise how his or her department actually works. Set up a paper test case and walk through the problem definition with people working at the sharp end. As you collect requirements test them again against your paper test case and correct any errors you find. When you start cutting code these paper test cases can be the nucleus of the test data you will feed through it.

Prototyping, to an extent, forces you into lifecycle testing, but you still need to take a disciplined approach. Look for errors even in early prototypes, and remove them promptly. Sloppy code or faulty logic may get through to the delivered system, because users of prototypes tend to concentrate on whether the system does what it is supposed to, not on its ability to do unusual things in exceptional circumstances.

Myers' tests

Luckily some simple, rational processes help to remove errors effectively. It is not a question of typing away at your

ective culture

terminal, like a monkey attempting Shakespeare, trusting you will eventually hit every bug. Eventually you will, but as with the literary monkey scenario, you (or your clients) are probably not prepared to wait that long. Myers describes several techniques:

Boundary value analysis. This relies on the fact that bugs are more likely around the boundaries of a set of acceptable inputs or outputs. If a program is supposed to accept integers between 3 and 9, then the values 2, 4, 8, and 10 are worth testing, as are non-integers either side of 3 and 9 and both 3 and 9 themselves. You are testing the edges of the specification you're building to. When you document such test cases make sure you also document the expected results, or you might miss something – in this case, it isn't clear from the specification whether the valid range is inclusive or exclusive.

Equivalence classing. This is about dividing potential test cases into sets likely to highlight similar bugs, and running only one or two tests in each class. In our example of a program accepting integers from 3 to 9, integers between 3 and 9 would be one class, integers below 3 and above 9 two more, and non-integers a fourth. Obviously if the program works with inputs of 4 and 8 it might still fail with inputs of 5, 6, 7, but as they are all in the same equivalence class it would be more cost-effective to try something else entirely.

Error guessing. Experience still has a role: guessing at the sort of errors programmers often make. I would always test a program such as this with an input of 0, -1, and space, regardless of any tests dictated by more formal test design patterns.

Once you have discovered structured testing and formal documentation of both the test case and its expected output, you have created reuseable test cases. Next time the program is maintained many of the original tests need simply to be rerun, which will save a lot of time. Anything which saves resources gives you more time to design more searching test cases, and therefore to find more defects. In particular, automated testing products are rapidly maturing, although beware of using them mindlessly as a sort of 'silver bullet'. You can design a set of test cases which continually explore the centre of one equivalence class, but go nowhere near the boundaries of the acceptable inputs. Automating this will still find only a small subset of the bugs lying in the code.

Good test-design products (such as TestSuite from Mercury Interactive) can reduce the resources required to build and run tests. Automated testing is especially suited for regression testing (running a set of general tests after every change to ensure that nothing outside the scope of the change has been affected) and load/performance testing; getting a computer to run test scripts is much easier than getting a 1000 clerks to hit the enter key at the same time. These products can save a lot of time in the building of test scripts. You will also appreciate products (including Mercury's) that have test management features: you need to be able to store tests and find them again in an emergency situation, and to track defects as they are found and removed.

Sooner or later...

No matter what manual or automated method you use for testing you have to know when to stop. A given set of tests will find a finite number of defects. Unless the program being tested is changing, once a set of tests have found that ultimate number of errors, repeatedly rerunning it only wastes resources. To find more defects you must design new test cases. Unfortunately, since you don't know how many bugs exist to start with, you won't know when you've found each and every one. You may know from historical records how many defects are likely, on average, per thousand lines of code, and stop when you get near that amount. You can also graph the increase in the total of defects identified against time. When the curve levels off it is time for a new test set. Paradoxically, there are provably more defects left in a piece of code that has been found spectacularly buggy than in one which seems defect-free, because buggy code comes from bad programming or particularly hard problems.

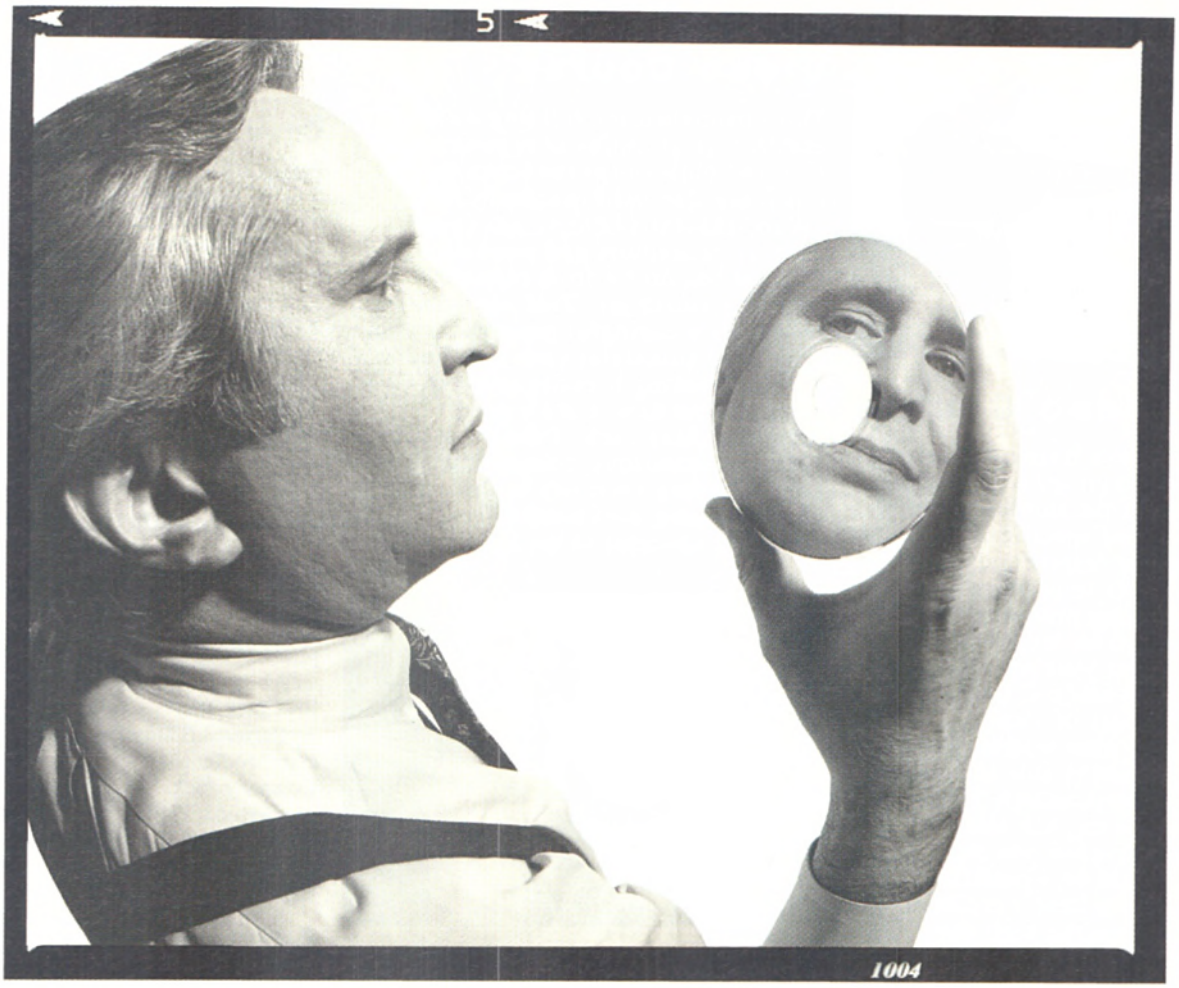
Despite their inherent effectiveness, the maxims Myers' presents in *The Art of Software Testing* must be built on a culture which doesn't tolerate defects. Such a culture might start with a ban on the friendly term 'bug' and the decision to call a defect what it is: a silly mistake which a professional programmer should be ashamed of. A culture which makes defects unacceptable can be set up by ensuring no one tests their own code, and that people move around the functional areas of the organisation. Everyone is more forgiving of their own mistakes than other people's. If you routinely work on other people's code you quickly see the value of quality (fitness for purpose) and effective (brief and accurate) documentation.

It can be done. Back in the 1960s IBM (I think) put some effort 'into training its customers to be more tolerant of bugs. But this approach didn't work out... so they decided to get rid of the bugs instead' (according to Tom DeMarco and Timothy Lister in *Peopleware*, ISBN 0-932633-05-6) and set up 'the Black Team' of specialised testers. Having your system tortured by the Black Team was a shattering experience. The (possibly apocryphal) story I heard was that when they found a mistake, a procession of black-clad team members would carry the offending listing, with a sword driven through it, around the office in solemn procession before dumping it on the offending programmer's desk. After a while the coders started taking a malicious pleasure in writing systems which the black team couldn't break, and would watch their struggles with glee.

An extreme idea? Well, it worked, although it was in an organisation which managed people as people, not as ciphers driven by fear (it might be a good idea to rotate people through the Black Team, too). I remember that when I had to write production database utility jobs in Australia several years ago we gave them to the night-shift operators to break before we used them (and a certain rivalry always persevered between operators and systems programmers back then). Not many of those jobs ever failed in production.

The biggest enemy of the 'bug' is an attitude which says that defects are unacceptable. Third party reviews and walkthroughs of specs and prototypes; Black Teams attempting to destroy a system before it gets a chance to destroy the business; and even an investment in automation to allow more efficient use of testing resources are all likely to produce a system of higher quality than the biggest beta test program the marketing department can imagine. ■

David Norfolk had a long and misspent career in database administration, quality assurance, security, and networking, mostly for big merchant banks. Finally the 'wodge and burn' style of the City got to him, so he retired to rural Wiltshire to live out his years as a journalist. He can be contacted at drhys@cix.compulink.co.uk.



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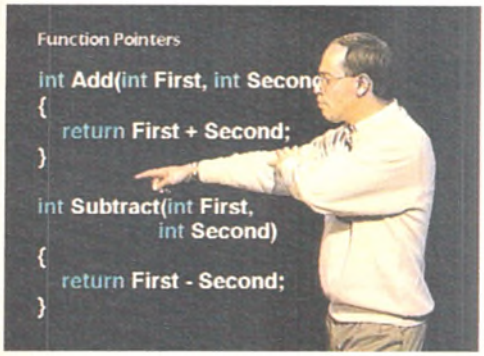

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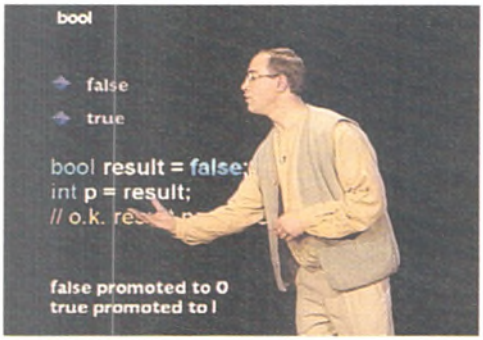

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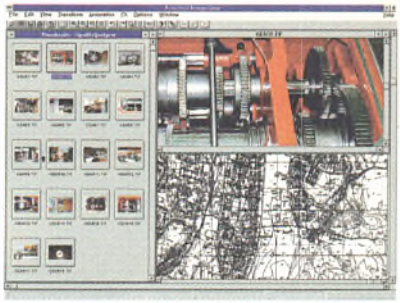

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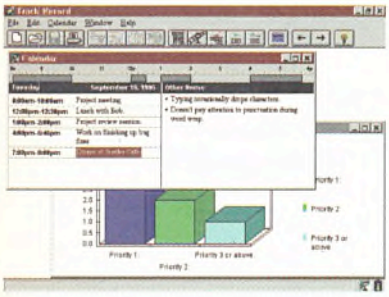

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nate errors. A complete restoration of the working methods of the sixties is not required, but nonetheless, wisdom lies in a return to some of these early established programming principles.

Get it right first time

Modern development tools, particularly those for the PC, encourage programmers to repeat the edit-compile-link-test cycle with too great frequency.

Once the purpose of a program or program module is defined, the prevailing technique has become this: first, get something coded. Anything that looks more-or-less right will do. Second, put it through the compiler. Compilation errors are expected, but they can be fixed to make the code compile. Third, put it through the linker. Linking errors are expected, but they can be fixed to make the code link. Fourth, run it. Runtime errors are expected, but perhaps it won't do what was expected at all. The programmer edits again, and repeats as necessary. It is not unusual to go through the edit-compile-link-test cycle dozens of times in one day.

Modern development environments, with their high speed compilers and linkers and runtime debuggers, encourage this way of working, but it leads to a sloppy mental attitude. Programmers view faults as things to be expected and patched up on discovery. The result is products that are a mess of patches and undiscovered problems. Contrast this to the way programmers worked thirty years ago. CPU time was precious. Programs were prepared off-line for entry, then compiled and run when the programmer had a time slot allocated to him. If the run produced an error, the programmer might have to wait until the next day before getting another chance. Programs had to be right first time, and programmers strove to achieve this.

Test it

How much of the code that goes out in production systems has not been tested at all? Most of it will have been run, and the results will have appeared correct, but the majority of program modules written nowadays have not been tested beyond that point.

The two classical methods of testing are white box and black box. White box testing assumes a knowledge of the program's internals, and should check that every possible path through the program is followed, and that in all cases the logic is as specified. Black box testing assumes no knowledge of the internals, but instead throws every possible input at the program. It confirms that the responses are what they should be.

All computer science graduates are familiar with the concepts of white box and black box testing. How often are they used now in the real world? Quality assurance departments rarely assist with testing. They tend to concentrate on whether company standards are being met, not on whether the product actually functions.

One can always say there is no such thing as bug free software – only a complete failure to detect bugs. Nonetheless, a lack of thorough testing can only result in production systems with errors waiting to be discovered by end-users. User acceptance testing is no longer a matter of verifying that no problems exist, but of identifying which problems must be fixed and which are not critical. Some software houses seem to have abandoned the idea of doing their own testing completely. They deliver beta versions of products to end-users, and expect them to do the testing instead. Some end-users are flattered by this approach.

Think about the hardware platform

Modern software is big. As processing power, main memory, and mass storage have dropped in price developers have become lazy about considering the capability of the host machine. They are no longer given budgets for the amount of main memory and mass storage they can use. As a result the equipment required to run quite simple modern applications is staggering.

The advances in hardware technology – and associated price reductions – may frequently be over compensated for by the demands of application software that does not offer greatly increased functionality. Programmers should of course be permitted to take advantage of hardware improvements, but all too often they assume a problem of performance can best be solved by running on better hardware, rather than by making the code more efficient. The former is a short term solution which will cause problems and expense for end-users, and encourage the attitude that 'so long as it works, it doesn't have to work well'. A powerful computer can cover up many software problems, but not forever.

Use a common library and a version control system

Modern development tools and techniques make programmers vastly more productive than was possible in earlier times. Frequently the application development lifecycle can be carried through, from initial proposal through to post-implementation review, by one person. This can give a product great conceptual integrity. Unfortunately developers become used to working alone, which can lead to disastrous results when these independent-minded individuals work on a project large enough to require a development team.

Software developers prefer to work independently of others and rely on their own functions, rather than banking on something written by someone else. Without strict control of source code versions and enforced use of a common tool and function library, much effort is wasted in duplicated work and reconciling each developer's copy of the source code with a master copy. Techniques such as object orientation, lexical scoping, and encapsulation make it much safer to have a group of programmers working on the same application, but also make it possible for them to work too independently.

Write for portability

End-users will rarely commit to a particular operating environment. Even if they want to, rapid changes in hardware and system software make it likely that an application will need to run on a variety of platforms during its lifetime.

Consider an X Window client application which will be written to the X11 specification. What about the capabilities of the X server? A developer might assume his application is going to run on a Vax server, with virtually unlimited TCP connections available, all the DEC fonts, and a Vax screen and keyboard. An end-user who subsequently tries to run it from a general purpose PC with an X server package may not be able to run it at all, or may find the keyboard mapping and display dreadfully cumbersome. Of course the rule should not be to write code for the lowest common denomina-

tor of server and client platforms, but developers should consider being less specific and not demanding too much. Most importantly the required environment should always be well documented, and wherever possible controlled by user-definable parameters that allow it to run on the widest possible range of equipment and system software.

Use a structured development method

Methods such as SSADM are criticised for being cumbersome, but they ensure that the end result bears some relationship to the initial requirements. RAD-type techniques often don't. Indeed the requirements may never have been defined.

To differentiate the two glibly, with SSADM, the functionality delivered is guaranteed, but the time and cost are variable; with RAD, the time and cost are fixed, but the functionality is not. The problem began when prototyping became feasible and acceptable. Rather than specifying the requirements then fulfilling them, developers found that with modern tools they could knock something together quickly, demo it, and tart it up later. All too often, 'later' drags on, fundamental design flaws are exposed only after the product has gone live, and (though eventually work stops) the development is never actually completed. A structured method, with its stages and check points, should ensure that this doesn't happen. If it does, the post-implementation reviews should make this clear. Lessons can be learned for next time.

Perhaps current attempts to give RAD some respectability will work – but only by turning it into a structured methodology similar to those it claims to replace. It really doesn't matter what structured method you use, so long as you use one.

Hold your hand out, naughty boy!

What went wrong with software development techniques? The simple principles described above, established in the seventies and before, are no longer necessary for their original purpose, to make the most of scarce machine resources. However they are still badly needed to ensure the quality of products delivered to end-users. Why aren't they universally applied?

First, because of microprocessors. Since desktop and home computers appeared, the IT industry has been beset by hackers. One wouldn't commission someone to build a bridge unless he had an engineering qualification, but people will happily buy mission critical software from self-taught hobbyists. Amateurs have an extraordinary influence in the industry and in end-user organisations. Everyone has encountered computer specialists in end-user companies who are viewed as heroes because they taught themselves to program at home, and therefore know more about IT than any professional. Within the industry Computer Studies graduates are often justifiably criticised for having plenty of theory but no idea of how things work in the real world, but having all experience and no theory is not better. Perhaps business should take more notice of organisations like the British Computer Society, which attempts to raise professional standards by insisting on both academic and practical knowledge as membership criteria.

Second, because of 4GLs. Fourth generation languages are wonderful productivity tools for end-users and professionals alike, but the ease with which one can knock up something that works sometimes leads to the fallacious thought that the whole system development lifecycle can be de-skilled. The perceived value of proper training and methodologies drops when a layman can produce something that (at least to begin with) is effective. 4GLs and end-user development tools should be used for building applications, not for short-cutting the process of designing them. With high productivity tools the ratio of time spent on analysis to time spent on coding should increase, not decrease. It is erroneous to think that facilities which speed up the actual coding stage of the development cycle can also shorten the investigation stages.

Third, because of marketing. Too many development tools are promoted as being easy to learn, suitable for end-users, and highly productive. The sales pitch and the manuals imply that a successful development starts at the keyboard, and that reading the help screens is ample solution for someone who's stuck. The time to be spent in analysing requirements and reviewing results is never mentioned. Removing the mystique from computing is fine, but it should not be presented as something simple to exploit. IT is complex, and should be sold as such.

What must be done?

Long ago the technical professionals in other fields realised the necessity for standards. They can be taken too far – some would say the closed nature of the legal profession, for instance, can lead to the public being exploited – but IT is at the other extreme. Anyone can set up as an IT specialist. It is not easy for a customer to distinguish between those that take a painstaking, strictly controlled approach to their work, and those that produce superficial products with hidden flaws.

End-users need to understand that you get what you pay for. The lowest quotation can be the lowest quality. Selection of a mission critical system may determine the success or failure of the whole enterprise, so it is worth investing time to investigate the developer's methods and quality control standards. Don't be fooled by ISO9000 accreditation. It says nothing about the absolute level of quality, only whether an arbitrary level – specified by the developer – is achieved.

Suppliers need to accept that formal training, techniques, and qualifications are needed and hence must be paid for. When a monkey is recruited to plug machines together it doesn't matter whether he has a Computer Science degree or not, but in ten years time he may be your Software Development Manager. If he hasn't gained formal qualifications by then, and applied this knowledge to his work, your products will suffer and your customers will (eventually) suffer too. So will you.

Both groups need to realise that a commitment to quality, standards, and formal methods is worth more than the promise of a quick solution. The IT industry and its customers need to go back to school to learn some basic discipline again. ■

John Watson is currently a software support team leader for Tecnodata Italia, working at the European Space Operations Centre in Darmstadt, Germany. He can be contacted as jwatson@esoc.esa.de.

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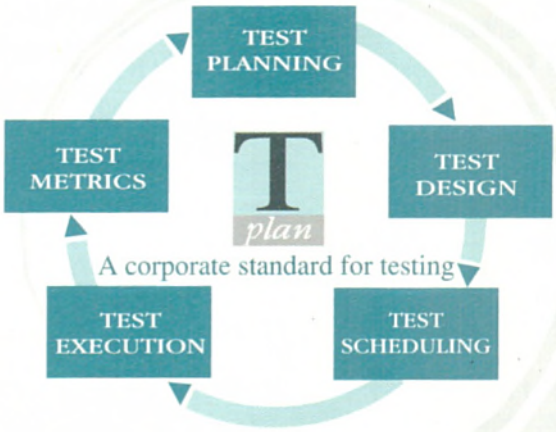

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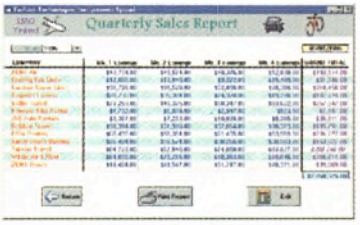

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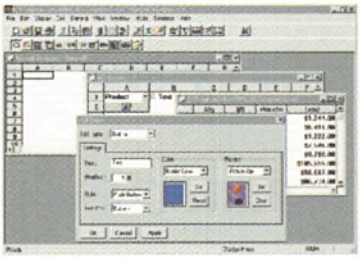

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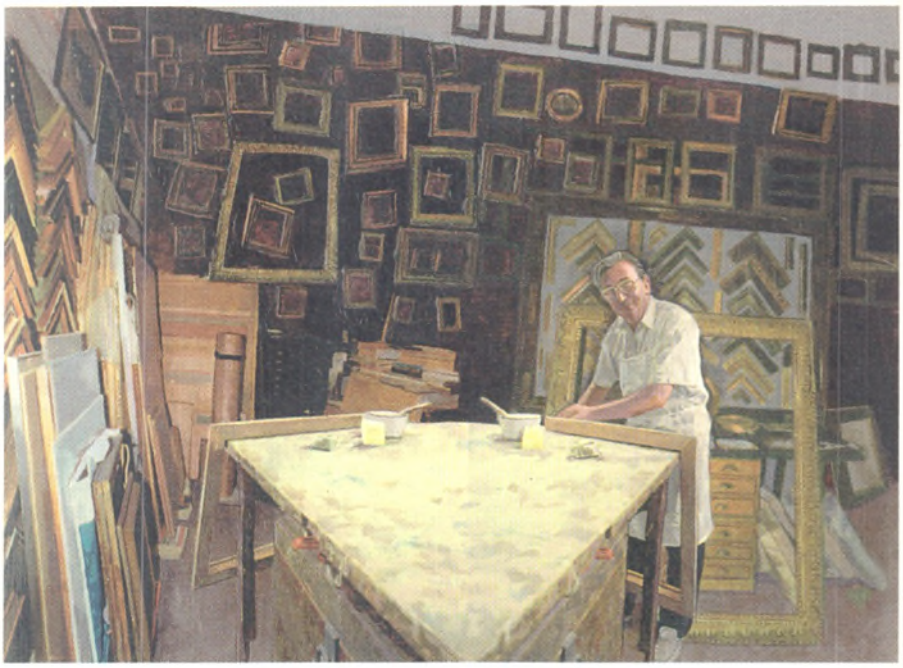
MISSION: HTML

'Your mission,' said the Editor, 'should you choose to accept it, is to redesign *EXE*'s Web site. We have the technology: we *can* re-build it. This memo will self-destruct in five seconds.' Fearlessly, **Neil Hewitt** picked up the gauntlet, and now he shares a few trade secrets about frames...



Louise Weir

When work began on *EXE OnLine*, a revamped World-Wide Web service to replace the incumbent *EXplodE*, I had to try and restrain my own enthusiasm for hundreds of graphics, excessive (and unpleasant) use of colour, and Java applets by the tens on every page. The over-generous use of these 'advanced' HTML features was probably the most valid criticism of *EXplodE*. Time to learn the basics of good page design, which in hindsight I would suggest are:

- **Keep it simple, stupid.** The prime directive of HTML. Remember that pages on screen are always more difficult to read than pages on paper. What works in a magazine does not necessarily work on a Web site. Always think about putting less rather than more information on a page because unlike a magazine, having extra Web pages doesn't throw your whole publication out of kilter. Lots of space, judicious use of colour (no luminous violets unless its entirely artistically justified), and short paragraphs make for more readable pages.
- **Graphics take time.** Basic HTML is very difficult to lay out. Even with handy features like tables, the Webmaster's control over the text is limited. Because graphical images will always look the same, there's a distinct temptation to use lots of them: we've all seen sites which take this approach, including a fair number of the larger corporate pages. Don't do it. Remember that most Web users still have 28.8 Kbps modems. If a page takes too long to download, they'll simply surf elsewhere. Use graphics sparingly, keep the size and colour depth down, and try both GIF and JPEG compression schemes to see which one comes out smaller. Also, think cache: if you use the same small logos or motifs throughout your site, they only have to be downloaded once.
- **Don't get caught out.** It's dangerous to assume that everybody will be using the latest browsers. Some users prefer to use less well-known browsers, while some are limited in the choice available for their platform or operating system. Your readers could be using Commodore Amigas, Acorn Archimedes or Atari STs just as easily as Macs or PCs, not forgetting OS/2. There are also lots of old-version copies of Netscape out there which people are not prepared to upgrade every couple of months. If you make your site dependant on the latest additions to HTML, you will be locking these users out.

The good news is that it is possible, with careful planning, to use advanced features without denying less up-to-date users access to such sites. The best example of this on *EXE OnLine* is our use of *frames*. We have provided a 'frameless' version of the site to cater for those whose browsers do not support them: this was made possible by an 'escape' route built into the frames definition, which I will discuss in more detail later.

Frames are possibly the most important addition to the HTML standard since the introduction of tables, but they are still not well-understood, and are decidedly underused. This is almost certainly because, until recently, they were supported only by Netscape browsers. Now that Microsoft and others are including frame-handling code into their software, I'm sure that they will be more widely seen. For the moment, Web developers are stuck with constructing frames manually, unless they are using Microsoft FrontPage or SoftQuad's new HoTMetaL Pro 3.0, and to this end I thought I'd present a quick guide to the frame tags and how to use them effectively. Before moving on to the more advanced aspects of their use, let's just take look at how frames are implemented in HTML.

The HTML frame tags

Two tags control the implementation of frames within HTML: the `<frameset>` tag defines the sizing and positioning of the frames, while the `<frame>` tag specifies the attributes of each frame including the information to display within it. Rather like the `<table>` tag, `<frameset>` tags can be nested to create very complex framesets.

The Listing 1 shows an HTML sourcecode example which implements a frameset, in this case for the *EXE OnLine* News department. Figure 1 shows the finished page generated with this frameset as viewed in Netscape Navigator.

The **<frameset>** tag has the following format

```
<frameset [ cols | rows ] = "n%,
n2%, n3%...">
```

where **cols** or **rows** is an attribute (you must specify one or the other, but not both, in each **<frameset>** tag) defining whether the frames will run vertically or horizontally across the page, and whose argument is a comma-separated list of integer values which indicate the percentage of the browser window which the frame will occupy in the direction specified. In order to create both horizontal and vertical frames, nested **<frameset>** tags are required. Don't forget that the order of definition is crucial, in that second level framesets and beyond can only divide up the space left by the preceding frameset.

In fact, the **<frameset>** tag accepts both integer values and percentages to specify the frame size, although most tools which allow you to visually generate framesets enforce a percentage figure. This has the effect that when the browser window resizes, so do your frames. The relative layout of the page remains the same. This is not always a good idea. In the example of *EXE OnLine*, the frames around the page are intended to display graphical images, whose size does not change, and where having to use a scrollbar would be inconvenient. For this application, we wanted the frames to remain the same size regardless of the dimensions of the overall browser window. Specifying the frame size in absolute pixels rather than percentages makes this possible, although this is not generally well known. Note that in Listing 1, only one figure is given in each tag; using an asterisk for the second parameter indicates that the leftover part of the window is to be sized by the browser. This allows the main content window to resize while keeping the smaller frames as they are (just as well, because if none of the frames could resize the results would be unpredictable!)

One or more **<frame>** tags must follow immediately after the **<frameset>** tag, one for each frame defined. The **<frame>** tag has the following format

```
<frame src=[HTML file or anchor],
name=frame1 [scrolling=yes|no|auto]
[noresize]>
```

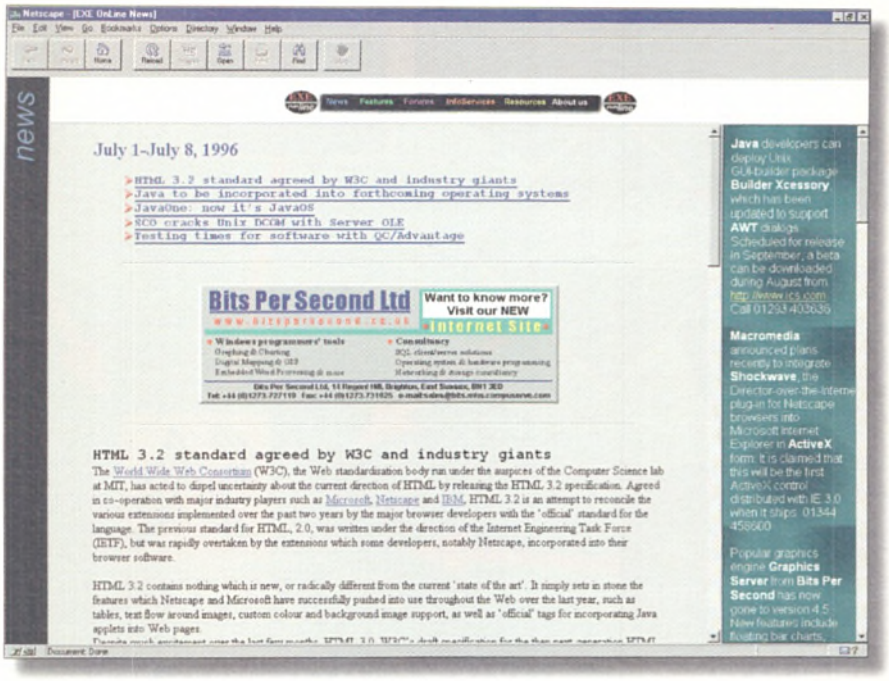


Figure 1 – A frameset on EXE OnLine.

where *HTML file or anchor* is the name of the file and/or anchor point which is to be displayed in the frame, **scrolling** controls whether or not a scrollbar appears on the frame – **no** prevents it, **yes** puts one there at all times, **auto** adds a scrollbar only when the frame contents get too big for the visible size – and **noresize** stops the user from being able to resize the frame by dragging. The **name** attribute is included to allow developers to give a frame a title which can be used to reference it as the target for a link (see below for a more detailed examination of this topic).

After the **<frame>** tags, there must be a **</frameset>** tag to close off the frame definition. This is compulsory.

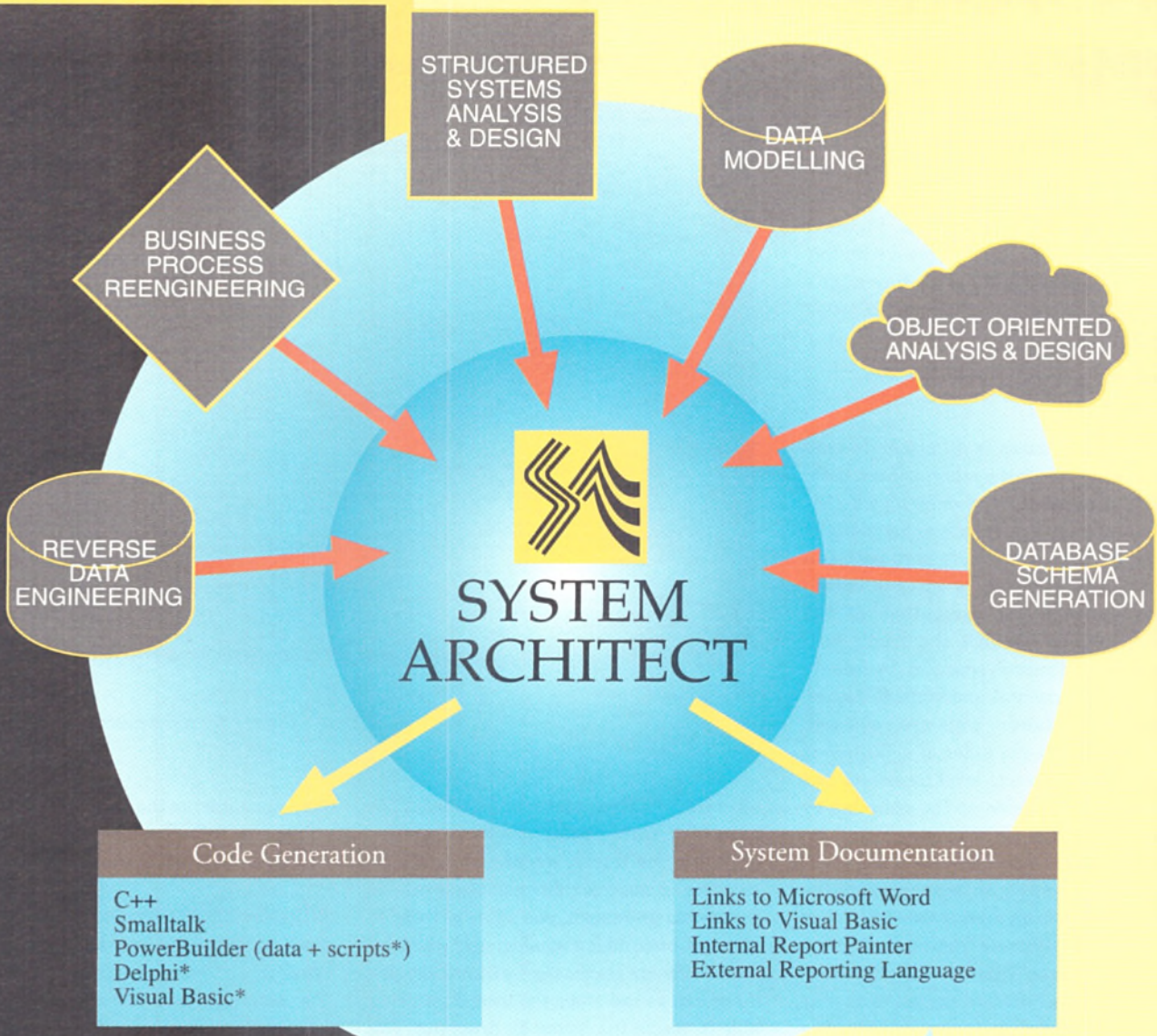
To get your frames up and running, remember that the main link to the framed area must refer to the HTML document containing the frameset definition, not the page or pages which will appear in the frames.

Standard behaviour

Each frame is effectively a separate browser window, and behaves more or less as such. For example, if we place a link to another page within the default document for a frame, any attempt to follow the link will display the second page within the same frame, and not affect the content of the other frames. This is highly desirable behaviour most of the time, and it's how our new site design works. Each 'department' on the site has its own frame set (most of which are identical), but all the pages within the department appear only in the central frame.

```
<HTML>
<HEAD>
<TITLE>EXE OnLine News</TITLE>
</HEAD>
<FRAMESET COLS="60,*">
  <FRAME SRC="newstrip.html" NAME="sidebar" SCROLLING="no">
  <FRAMESET ROWS="62,*">
    <FRAME SRC="blackbar.html" SCROLLING="no" NORESIZE>
    <FRAMESET COLS="*,200">
      <FRAME SRC="news.html" NAME="long">
      <FRAME SRC="shortnews.html" NAME="short">
    </FRAMESET>
    <NOFRAMES>
<BODY>
<P>This web page uses frames, but your browser doesn't support them.</P>
</BODY>
</NOFRAMES>
  </FRAMESET>
  </FRAMESET>
</HTML>
```

Listing 1 – This HTML code defines a complex frameset.



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There are likely to be occasions where the Webmaster wants to override this default behaviour, particularly when making a link to an external site or a page which should appear on its own. The `<a>` anchor tag provides an attribute, **target**, which specifies which frame a page should appear in. The argument for **target** should be the name given to the frame when defined. In addition, there are four pre-defined arguments which can entirely override the frameset. The most common of these is **_top** (note the underscore), which causes the new page to be loaded into the entire window, while **_blank** requires the page to load in a new browser window. **_self** specifies that the page will be loaded in the same window as the link (this is the default behaviour, so is rarely needed), and **_parent** causes the page to be loaded into the 'parent' (or first-defined) frame on a page.

The escape hatch

As explained, the frame tags have a sort of escape hatch through which it's possible to support users without frame-compliant browsers. This is provided through the **<noframes>** tag which, if it is to be used, must follow the **<frameset>** tag for the frames to which it will refer. This tag takes no attributes or parameters, but whatever is enclosed within those **<noframes>** tags will be displayed when the page is loaded into a non-compliant browser.

There are a number of ways in which this facility can be used: the most obvious is to place a simple message explaining that the page requested requires frames, which is an unsupported feature on that user's browser. Our example code in Listing 1 does this. Alternatively, a link to a different or non-frame version of the page could be placed into the text. Or, more ambitiously, the entire HTML source for the alternative page could be placed between these tags, which would mean that the page would load seamlessly where there was no browser support.

EXE OnLine was originally implemented with the brute-force method of providing a separate set of pages for the frameless browser, and requiring the user to click to access them. Future revisions of the site will incorporate the technique above to make the whole thing seamless and transparent to the end-user. For the next few months at least, while some users still have non-frame-compliant browsers, the escape hatch will remain a useful thing to know about.

Frameset or Frame set?

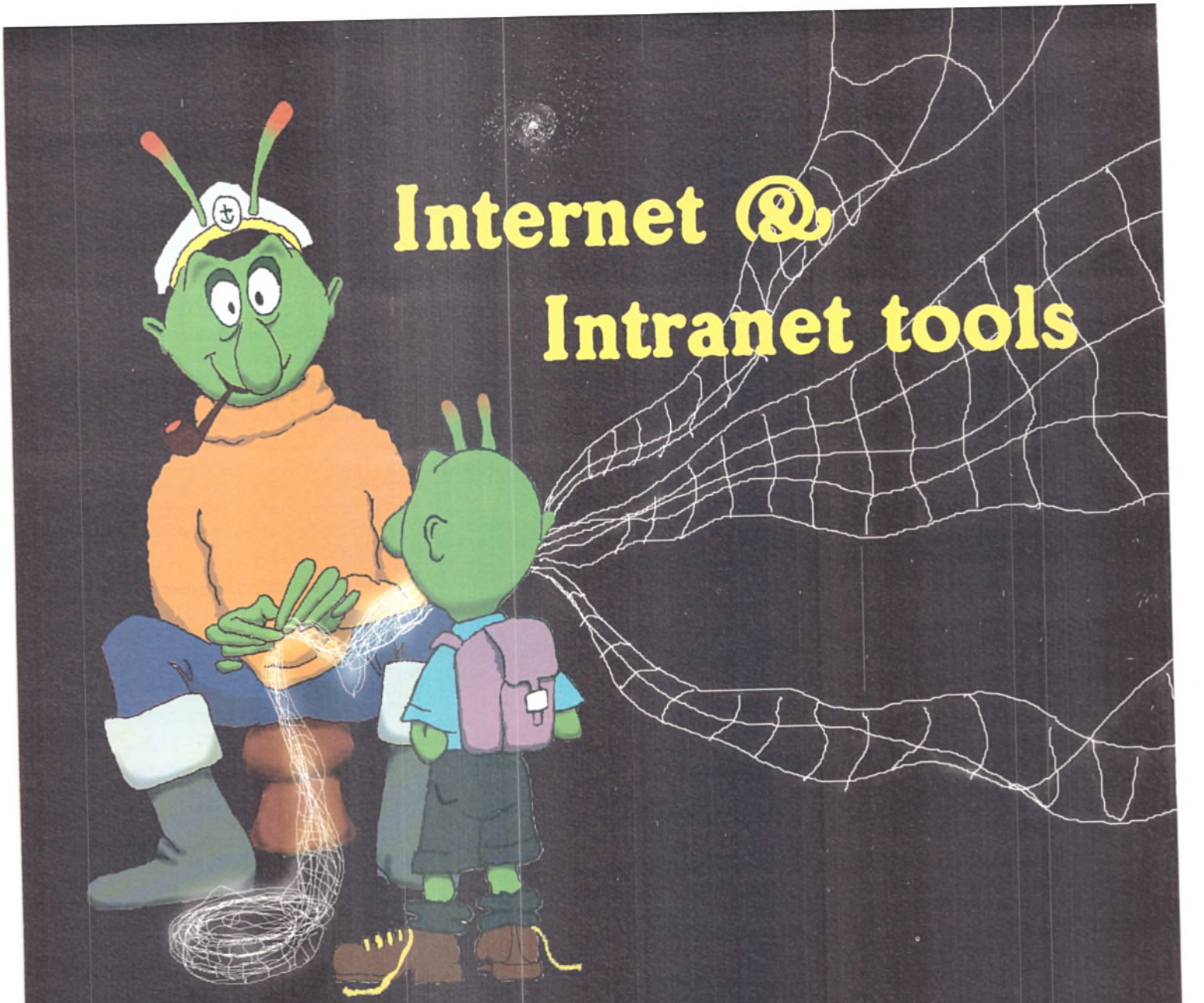
The attentive reader may have noticed that while I have referred time and again to 'frameset', I did at one point write 'frame set'. This is not a typo. One of the most confusing things at first when working with frames is that those frames defined within a particular **<frameset> – </frameset>** pair are (logically, I suppose) referred to as a *frameset*. However, since there can be more than one frameset on a page, and since in most cases the whole page is nothing more than a definition of frames into which other pages will load, there needs to be a name to call the whole thing. Rather unimaginatively, this has come to be known as a *frame set*! You can't imagine how many frustrating conversations this little naming convention has brought about. If you can think of something better, please let us know...

So why use them?

There are a number of sound reasons to use frames – and a number of sound reasons not to. It all depends on the application. There are certain occasions when it is very useful to have more than one set of data on the screen at the same time, each with independent scrollbars. Frames have also been used to keep adverts on the page at all times, so that they don't scroll away as you move down the main page, although they take up an objectionable amount of screen space and users universally find them intensely annoying.

The most compelling use of frames so far hinges on that one property – that whatever you put in a frame remains there, on the screen, no matter where you go in the rest of the page, or by extension, in the site. For this reason it's an ideal method for putting navigational controls in a place where they're always accessible. Some sites, such as Gamelan, a site dedicated to Java (*http://www.gamelan.com*), and Netscape's new site (*http://www.netscape.com*) use frames for just this purpose very effectively. As, in fact, does *EXE OnLine*. Through our nonresizeable absolute frames, we can keep the site navigation bar on-screen at all times, making it easy to hop from department to department, and give a real sense of continuity between all the pages.

What the aspiring Webmaster shouldn't do is use frames just because he can. Net surfers are a notoriously fussy audience, and sites which look over-dressed, graphically garish, or needlessly complicated will quickly lose visitors.



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Getting to grips with NT

EXE's regular Unix expert has broken with tradition and purchased a Windows NT machine. After linking it with his Unix LAN **Peter Collinson** discovered he hadn't known what he was missing.

September marks my 20th year of involvement with Unix. I've been a dedicated user, administrator, programmer, lecturer, machine operator, consultant, user group worker, and author on Unix topics. I even spent some time selling Unix systems. Of course I've used other operating systems; my office has sported a Windows machine for some time, long enough at least to track the various Windows releases. However it got stuck at Windows 3.1. I haven't upgraded it to Windows 95, largely because the machine has become a production system for many applications and I didn't feel it was a great idea to install a new system and risk having everything fall over.

Since its release I wondered about Windows NT. I was put off by the initial sales line boasting 'New Technology' and the system's primary role as a 32-bit computing engine. I was into 32-bit computing way back in 1980 when we installed a VAX11/780 to run Unix at the University of Kent. To me 32-bit working was not very new.

I wondered some more about NT in the last few years while I was a Unix systems vendor. Many sites were installing NT for a server but buying Unix to act as an Internet front-end. NT didn't provide some of the 'network glue' like a Domain Name Service. This would surely change, I thought, and it did. The newer beta versions of NT come complete with a DNS server.

Three months ago I stopped wondering and bought a system that would run NT. The decision was a little like entering a minefield. Information about the operating system is plentiful, but it is mostly marketing platitudes. For example, NT comes in two flavours, NT Server and NT Workstation. Which should I buy? Microsoft's Web pages offer little help in distinguishing the difference between the two systems.

Workstation is designed to be a single user system, much like a Windows 3.1 or 95 system. It provides CPU cycles to users running applications. But NT Server is not really designed to be a multi-user machine like traditional timesharing systems. Instead it is intended to offer the management tools needed to support workstations, and contains a Directory Services manager allowing it to administer users in administrative domains. Don't confuse these with the DNS used to supply naming to the Internet. NT domains represent groups of users sharing sets of files on a network. Anyway, it became clear that I didn't need NT Server. A copy of NT Workstation would do, at least at this stage.

I ordered a machine with 32 MB of memory, just on the edge of not enough. The system also has a six-speed CD-ROM, which has proved a necessity since the CD is the preferred delivery medium of all things NT. Having a fast drive makes everything simpler and means much less time is wasted on installation.

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The machine arrived with NT Workstation 3.51 pre-installed. By plugging the right wires into the right sockets and turning on the power I had a working NT system. At first sight, apart from the need to login, things didn't seem too different from Windows 3.1. The GUI is familiar and instantly useable. But NT has a few nice twists brought about by the availability of CPU cycles. When a window is resized in the Program or File Managers, for example, the icons move to fit the available space.

The first thing the NT newcomer must do is create himself as a user (assuming Administrator status is not desired) by messing with the User Manager. I created an unprivileged user intended to be me, then needed to do more system administration. A moment of great panic arrived when the system wouldn't let me login, even when I carefully retyped the password. I supplied it twice, convinced I was typing it correctly, before realising case is significant in user names. The Administrator name must be entered with a capitalised initial letter. I gave my personal user name full privileges to change things on the system, and have not logged in as Administrator since.

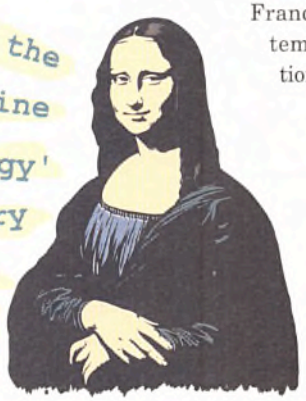
I had to install the TCP/IP networking drivers, which was easy once I worked out the make of network card installed in the machine. Soon the NT system was up and running on my Ethernet. A good set of standard TCP/IP diagnosis tools is included, with a **ping** and a version of **traceroute** called **tracert**. NT wants to use the Session Message Block (SMB) network for its own remote file access, and would prefer its own naming service, **WINS**, to map machine names onto network addresses. However, it's happy to be told to use the Domain Name service and be given the address of a local DNS server. My NT system was ready.

What's in NT?

Windows NT is a micro-kernel operating system. A micro-kernel is a small fast management program sitting on top of the hardware. The kernel handles the fundamental system services, and hands off more complicated requirements into processes running on the system. Some of the tasks that were traditionally handled in the kernel are now performed by processes it manages.

Rather than all user applications obtaining operating system services directly from the kernel, a user application will communicate to another user level process (a *subsystem* in NT terms), which in turn talks to the kernel. All these processes are equal, although with NT the opportunity exists to affect their scheduling priority. It's the job of the subsystem process to present the user application with the interfaces that define the application operating environment. Communication between processes is usually done using messages. Requests and answers between applications, subsystems, and the kernel are placed into messages rather than being invoked by a traditional procedure call.

I was put off by the initial sales line boasting 'New Technology' and the system's primary role as a 32-bit computing engine.



The benefit of the approach is modularity. Clean interfaces to small modules each doing a well defined task makes for easier coding. The modules fit together better, providing alternatives at many levels in the system. The message sent to obtain a service can be routed to a different destination to obtain a different variety of the same service. Therefore it's easy to have several subsystems, each supplying the same interface to the user applications, but supporting different underlying semantics. For example, several file system models can be supported. NT supports three different file systems for magnetic media, and the ISO9660 or 'High Sierra' file system for CDs.

Having different subsystems offering different application interfaces, yet talking to the same underlying model of the system, is also easy. Some Unix based micro-kernels will offer both System V and BSD semantics in subsystems to different user processes.

The first message passing micro-kernel I ever came across was Accent, created by Fitzgerald and Rashid at Carnegie Mellon University in the mid-eighties (the work was published in 1986). Accent didn't start by offering Unix semantics, but a Unix layer was added later when such a facility was recognised as a way to get many user level applications. It ran on the Perq, an early workstation with a bitmapped screen, but the project was not too successful because the machine ran slowly. The Perq processor didn't have enough spare CPU cycles to cope with the load – packing and unpacking messages is simply not free. However, the operating system outlined the way that messages could be used, and proved the notion of micro-kernels, subsystems, and processes.

Rashid went on to be responsible for Mach, a micro-kernel which supports Unix user processes and runs with much of the Unix functionality in other subsystem processes. DOS was implemented as a subsystem on top of it in 1991. Another micro-kernel of note is Chorus, from France. Chorus too has subsystems that provide Unix functionality to user processes.

NT employs this line of thinking. It handles 32-bit windows applications, Windows 3.1, OS/2, and Posix compatible applications using subsystems that present the functionality that is needed by each application in a separate subsystem. The applications and the subsystems are user level processes running on top of a set of executive modules and a kernel. The Executive and the kernel are loaded at boot time, and run in kernel address space on the machine. All other programs run in user mode at Ring 3.

NT kernel and Executive

At the lowest level in NT, just on top of the hardware, sits some code known as the Hardware Abstraction Layer (HAL). It permits the layer above HAL, the kernel proper, to be machine independent code. The kernel layer is responsible for thread handling, multiprocessor synchronisation, and hardware exception handling. Device drivers also sit on top of the hardware, and are managed by part of the kernel known as the I/O manager. It actually handles communication between device drivers. The kernel contains other components to handle file systems, network communications, and a cache manager.

Directly above the kernel, and loaded with it, are five components which comprise the Executive. The Virtual Memory Manager (VMM) provides NT processes with 4 GB address spaces, and handles paging to and from a paging file on a disk. Processes are managed by a Process Manager. This component provides a standard set of services for the creation and deletion of processes. These services are managed separately for each subsystem running on the

machine, so for example, Posix processes and threads the context of that particular subsystem environment. The Process Manager works with the VMM to give each process a protected address space.

The Object Manager creates, manages, and deletes Windows NT objects. Where Unix treats its world as a set of files, the NT environment is a set of objects. NT deals with files, directories, processes, threads, and the like as part of a single global name space. The name space is hierarchical like a file system, using the backslash character to separate the levels. The Object Manager is responsible for supporting the abstract data types used to represent objects.

System security is governed by the Security Reference Monitor. This part of the Executive provides information both to itself and processes controlling access to objects. Finally, the Executive contains a module that handles message passing. This is the Local Procedure call facility.

Above the Executive are several subsystems running in processes that are started when the system boots. The most crucial of these is the Win32 subsystem handling the graphical user interface, controlling user input and output from applications. It's this subsystem that the 32- and 16-bit Windows applications use to get things done. The latter, and MS-DOS applications, run in virtual machines (separate processes) which talk to the Win32 subsystem.

The application level

Outwardly the NT 3.51 GUI interface is the same as Windows 3.1. However, a bunch of new things in the Control Panel represent great improvements, and NT features several new applets. In addition to the User Manager (for adding users and maintaining their details) there is the Event Viewer. All system messages from NT are logged centrally. Inspection of the log can reveal problems with a system.

Help systems are extensive and reasonably well managed, but I am irritated by the disappearance of index boxes after a selection is made – I'd rather the index hang around until I am finished with it. Further, users must at times work too hard to extract information. The real problem is that users are expected to learn about how the system works via the Help system, but the information should be presented in a different way to make it suitable for learning. It works fine if you know what you are looking for – perhaps the right buzzword or phrase – but otherwise it is frustrating.

Several online books provide tutorial information, but they usually descend to the level of 'to do this, click this button, select this menu option, and there, you're finished'. This is fine when your goal is to get something done, but less suitable when you are trying to understand *what* you are doing.

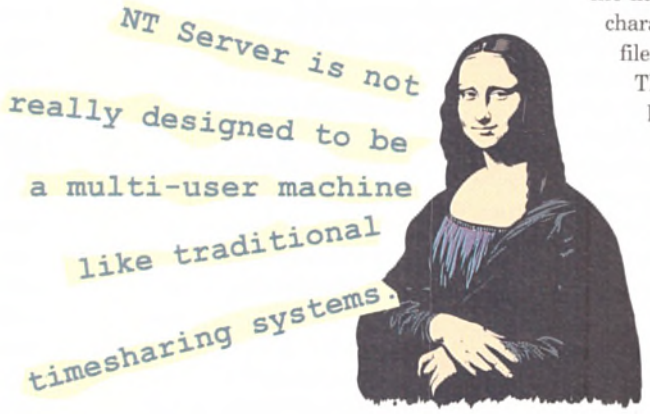
System facilities

Windows NT does away with the proliferation of *something*`.INI` files containing set-up information for Windows 3.1 applications. Such data is now kept in a central store called the Registry. When a program is installed it will place its information there for later retrieval. The health of the Registry is central to the operation of an NT system: my system became unstable after a couple of days of blind fumbling. Odd things began to happen, and I decided to re-install from scratch to discover if the system was broken, or if instead I had an incorrect perception of what was going on.

The Registry is a binary database, and an editor is supplied to change its details. It is not prominently placed in a system folder, because it's assumed that most users won't wish to mess with it. Applications on NT need a program that removes them from the system, and most have one. Don't add an old Windows application into the system unless you are sure you can remove its traces from the Registry. Mechanisms are provided for saving a system configuration and storing it on a floppy disk. They allow backtracking, but I was unsuccessful when I tried. I ended up re-installing the system a second time.

NT comes with three file systems, but support for the OS/2 file system, HPFS, has vanished from NT 4.0 Beta 2. To get the benefit of NT, disks must be run with the native file system, NTFS. The system *will* work using MS-DOS's FAT file system, but it won't provide the full NT file semantics. NT file names can have up to 256 Unicode characters, and can contain spaces. NT files have ownership and permissions. The NTFS file system is said to be less prone to data loss than the FAT file system, and so is worth using on those grounds alone. Sadly, details about how NTFS works are non-existent.

I found that my system would not install if I selected the NTFS option for my disk at install time. However, a utility is included that can convert from a FAT file system to NTFS. This doesn't happen on the fly. The utility schedules a request for the change to be done when the machine is next rebooted, which is typical of the easy system administration NT provides. Stopping the system or booting alternative systems are all simple mouse click interactions.



Networking

I want my NT system to be a full citizen on my Unix based LAN, which mostly runs TCP/IP. I use Chameleon NFS on my Windows 3.1 machine to pull files from my Unix machines and work with them using Windows tools. The NFS system presents another disk drive to the Windows system,

Where to get things

To get the NT 3.51 patches join the Microsoft Developer's network. The files are included on a CD that you will be sent. Otherwise use anonymous FTP to *ftp.microsoft.com* and change directory to */bussys/winnt/winnt-public/fixes/usa/NT351/ussp4*. Notice that English speaking systems are classed as 'usa'. There are directories for the different architectures supported by NT, so for Intel platforms change into i386 and pull the file *SP4_351I.EXE*.

The Samba home page is: *http://samba.canberra.edu.au/pub/samba*.

Find Windows NT related files for download with anonymous FTP on *sunsite.doc.ic.ac.uk*. Look in *computing/systems/ibmpc/windowsnt*. This is a mirror of *winsite.com*, but I was unable to get into that system to check it out. Too many users were online.

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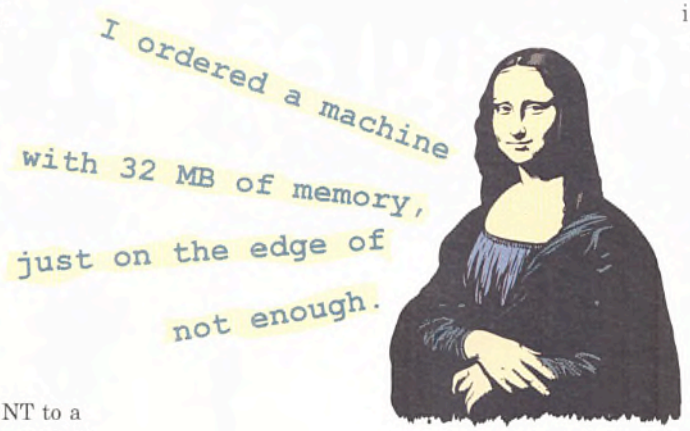
so file copying to and from the Unix systems works with no effort. Apparently a version of Chameleon NFS for NT is available.

I'd installed the TCP/IP stack on the NT system, but the TCP/IP tools are a little lopsided. There is an FTP client and server (be careful to set a new password on the Guest user account), but apart from those, the tools are mostly clients. Telnet can be used to get out to a remote machine, and with a version of **rsh** and **rexec** commands can be run on remote systems supporting these protocols. On the UK Sunsite archives for Windows NT are some **telnet** and **rlogin** daemons for NT. See *Where to get things* for more details.

A freeware option to connect NT to a Unix system is Samba, another product from the GNU stable, although this one originated in Australia. Samba provides a server, **smbd**, running Session Message Block (SMB) protocols to permit connections and file copying from Lan Manager, Windows for Workgroups 3.11, Windows NT, Linux, and OS/2 clients. It can give the NT system access to disks on the remote Unix machine and to printers, should your printer be directly connected to a host rather than on a TCP/IP network like mine.

Samba also contains an implementation of the Netbios name server, doing the browsing work that's needed to make the Network Neighborhood network lookup on the NT work nicely. Samba compiles and installs easily on both my Solaris 2.5 and BSDI systems. To run NT 4.0, get the most recent release of Samba. NT implementation is problematic, but recent releases of Samba provide a work-around.

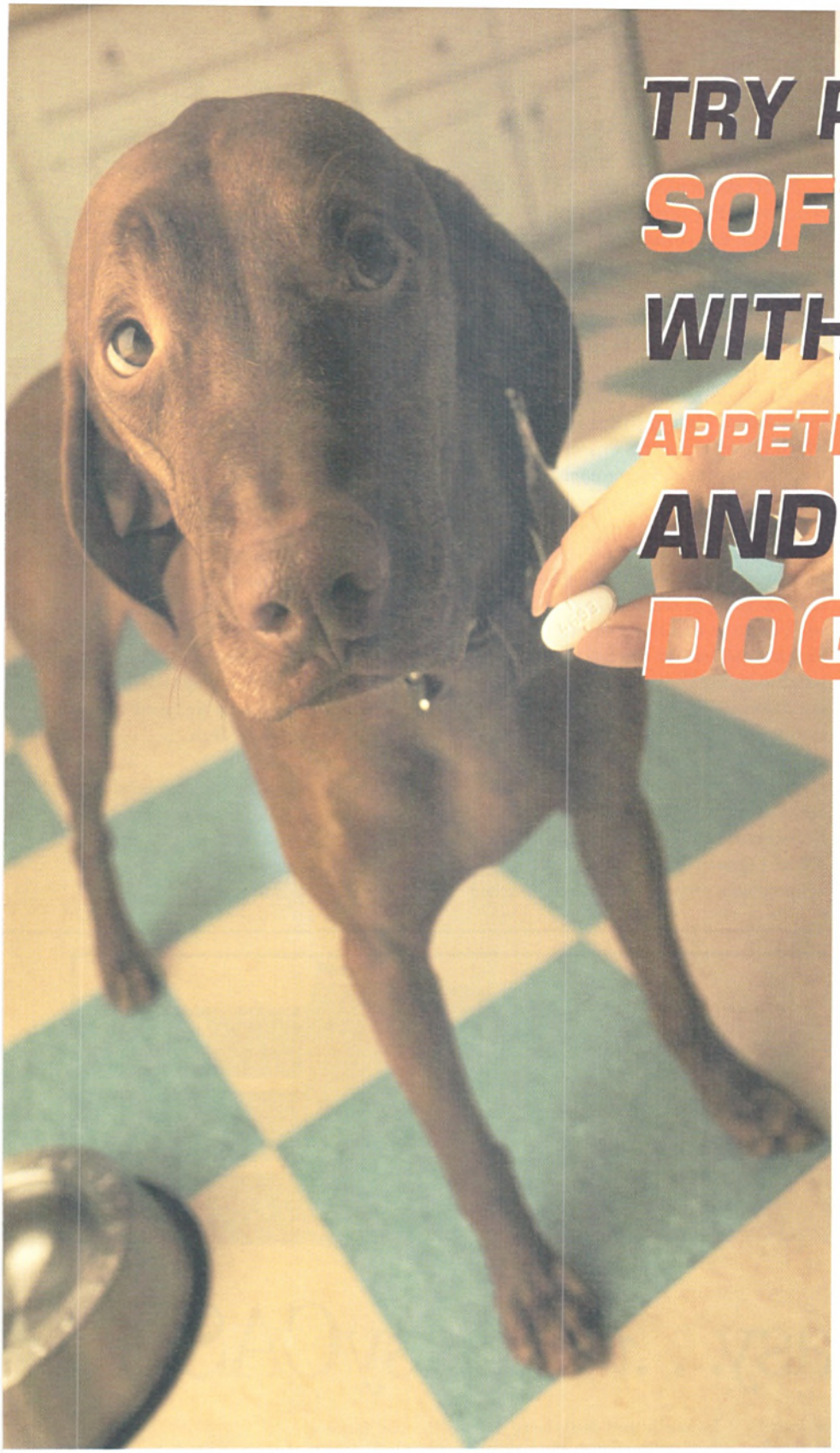


The **smbd** daemon is controlled by a configuration file. Pay attention to the security aspects of setting up the system and read the documentation carefully. I have not bothered with setting up a configuration file for the nameserver (**ndbm**). Simply running it as a daemon works fine to supply browser services to the NT machine.

Backup of files from the NT machine is somewhat lacking in versatility. The backup program demands that you have a tape drive on the system. A version of the **backup** program will copy files to a named disk drive, but I cannot get this to work onto a mounted remote disk. Samba provides a hook so that you can run **tar** on the Unix tape drive, but I have not investigated this yet. Ideally, I would like an NT tape device driver that implements the Berkeley remote magnetic tape interface (**rmt**). I am still looking.

Bits and pieces

If you intend to run with NT 3.51 because it's standard, get hold of the set of patches called the Service Pack. At the time of writing Service Pack 4 is the most recent. It contains all the patches from previous packs so one FTP file request is all you need.



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I elected to spend yet more money and join the Microsoft Developer's Network, which resulted in a large parcel of CDs, one of which was the Beta Release of Windows NT 4.0. Later Beta 2 arrived. After one false start (because I didn't read the documentation closely enough) I earned the ability to boot both NT 4.0 Beta and NT 3.51 using the same NTFS file system.

Windows NT 4.0 Beta shares its GUI with Windows 95, complete with the START button. I much prefer this interface to the old Windows 3.1 style. It doesn't get in the way of what I want to do, and I get more on the screen. I like the notion of the tabbed areas of dialogue boxes reusing the same screen area. I am also appreciative of the intelligent use of the right mouse button to generate a selection menu. The new GUI is something that Microsoft has got right.

EXE sent me an evaluation copy of a product called NuTCRACKER (NuTC), designed to provide a library and run-time system for porting Unix programs into the NT environment. It can support programs ranging from those intended to run on the command line to programs using the Motif X interface. X programs can be mapped onto the regular Windows GUI, or can run using the X server provided with the program. On the surface this product looks interesting, but I have not yet used it 'in anger'.

NuTC also contains the MKS toolkit for Windows NT. I reviewed the MKS toolkit some time ago (*Unix tools on DOS, EXE*, September '91). It provides a set of Posix compatible commands tailored to run in the NT command line environment. The package provides a creditable Korn Shell clone which I use in preference to the standard NT command line interface. The toolkit also contains useful Unix utilities including `ls`, which I keep typing on whatever system I use; various copy and move applications; the Unix `find` command, and many more.

Finally...

I am getting on nicely with Windows NT, but it is not going to replace Unix as my main work horse at this stage. First I'd need NT Server to replace all the Internet functions handled by my Unix machines. Second, NT is still somewhat flaky – I've re-installed the system from scratch three or four times to ensure that programs are running properly. I am guessing the uninstall mechanism doesn't always do a complete job, causing the Registry to become corrupt. Occasionally my NT 3.51 system starts up okay, but runs all my processes very slowly. I suspect a scheduling problem. Third, on my site NT needs the warm helpful support of the Unix systems that sit around it.

However, NT has displaced Unix for all my Microsoft Word needs. Luckily Word 7 files work with Word 6. I am also using programs from the Corel Draw 6 package. Unfortunately parts of this suite seem to have the capability to take the Win32 subsystem down, leaving a running machine but no ability to communicate with it. Sometimes NT catches the Draw or Paint program trying to write somewhere that it shouldn't. Perhaps on a DOS machine the programs are just spraying data everywhere. I am actually fairly disgusted with the Corel 6 package as a whole. It is expressly sold as being able to run on NT, but in reality it is not solid. Using some of the Corel programs on NT 4.0 Beta Release 2 causes some problems too. I've simply given up trying, which is why I still have NT 3.51 installed. Corel says 'we haven't looked at the Beta release yet'. Sigh. ■

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

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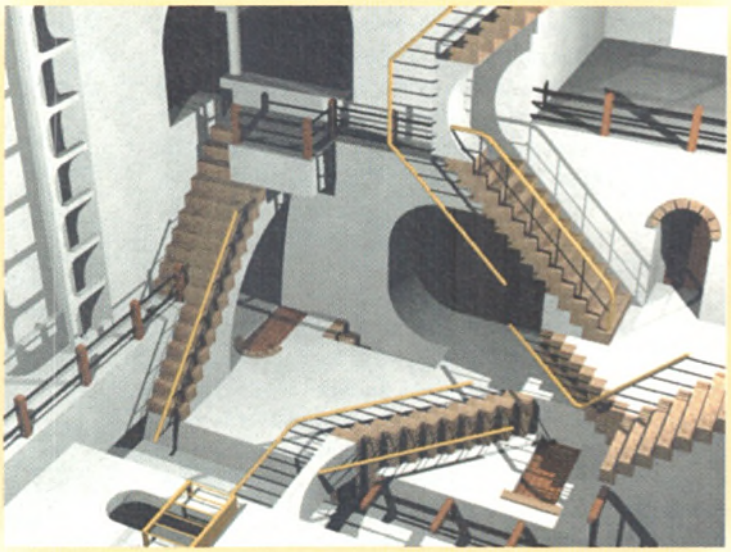
Abstraction & hiding

C really does support data abstraction and hiding, **Francis Glassborow** explains, no matter what other pundits may claim.



Gary Sweeting

I am irritated by some of the claims made for C++. When I hear experts say the language provides some special support for data abstraction and hiding, support that was somehow missing from C, I am left wondering how much they really know about C.

C provides good support for both these concepts. Its `FILE` semantic is an excellent example of data abstraction and, possibly, data hiding. I am surprised so few authors use this as an example of data abstraction.

All of us know what can be expected of a file object, but very few of us have ever looked at its implementation. We know we have no need of such details, and correctly suspect that the details may vary from one implementation to the next. All uses of `FILE` that I know of in C work through a pointer – programmers did not create `FILE` objects directly.

Although many implementors place the definition of the relevant structure in `stdio.h`, it is not necessary to do so. The declaration `typedef struct __file FILE;` is enough. It is all a compiler needs to manage `FILE *` values and variables. Similarly, prototypes are required for all the file handling functions (`fopen()`, `fclose()`, `fprintf()`, etc). Essentially declarations, not definitions, are needed. Of course the source code file that provides definitions for all the file functions will need a definition of `struct __file`, but that can be completely hidden from the user of `stdio.h` because the linker only needs the resulting object file, usually as a library. Unlike C++'s private, the data is actually hidden out of reach of the programmer. This can be done in C++ as well.

The function `fopen()` is an analogue of a C++ constructor. It creates a file object and returns its address for use. If I was designing C from scratch I might have passed `fopen()` the address of a `FILE*` as an argument, instead of relying on the programmer to capture the return value. A potential opportunity for silly programming would be eliminated and, more important, a better example for future programmers to follow when developing their own data abstractions would be provided.

The function `fclose()` is an analogue of a C++ destructor. All the other standard file handling functions are similar to the member functions of a C++ class. They are the only legitimate ways of accessing `FILE` objects. If you insist on looking at the details of `FILE` in `stdio.h` (assuming they are there) and using that knowledge, your code is as non-portable as it can get.

Another instructive element of the implementation of `FILE` in C is the `FOPEN_MAX` macro. It is only needed to check how many files an implementation can have open at once. Most implementations use `FOPEN_MAX` to create a global array of `FILE*` where the addresses of currently open `FILE` objects can be stored. This allows `exit()` to clean up by closing files. This information does not have to be stored in an array. Any container, such as a linked list, will do.

A lot can be learned by studying the way the standard library is put together. This does not mean it should be blindly emulated, but that intelligent study will reap rewards. Details of such things as the data structures used are usually too specialised to be worth consideration, but the ideas of data abstraction, data hiding, saving dynamic information for clean-up at program termination, and others should be part of every programmer's toolkit. Those who think they need C++ to implement such ideas reveal their shallow understanding of C.

A study of C's implementation of `FILE` will show that many internal functions help support the abstraction. They are not found in `stdio.h`, because they are strictly helper functions and not for general use. You will find them in `stdio.c`, qualified as `static`, so that the function names and their implementations are hidden.

Going backwards

I greeted Microsoft Visual C++ with pleasure. At last Microsoft seemed to be providing working programmers with a full implementation of C++. However, as I used it I became slightly disappointed. Things like the STL provision leave much to be desired.

I was guilty of making assumptions. Visual C++ 2.0 provided programmers with the new version of the C++ allocation functions, variants of `new()`, which throw `bad_alloc` if they fail due to insufficient memory. Granted the old behaviour – return of a null pointer – is still the default behaviour, but a help file and example show how to use the new form. I never checked this in Visual C++ 4.0, because I never imagined that Microsoft would go backwards. However, after my column on exceptions (*An exceptional exception*, *EXE* June '96) readers

informed me that Visual C++ 4.0 has taken a step backwards. The file containing the up-to-date behaviour is missing from the CD.

Two major aspects of programming are maintenance and porting. The longer it takes for programmers to move to using standard behaviour, the more expensive it becomes to do so. I am not throwing brickbats at programmers; the fault lies with the implementor. When writing code in an exception handling environment programmers should expect the default behaviour of the compiler is to support all the standard exception behaviour. It should be easy to do the right thing. The exception throwing behaviour of **new()** does have some problems, but these occur in a limited number of specialist domains.

Making a compiler default to a behaviour three years out of date, then making it hard for programmers who want to do the right thing, appears to be a recipe for disaster. Of course the market leader has good commercial reasons for making it hard to port code to other more conforming systems. However, the programmer has good long term reasons to avoid being tied to a specific product. The word 'hubris' springs to mind.

A pleasant surprise

When I was checking the code for the problem at the end of this article I grabbed the first compiler to hand. I had been doing some work on Java, so it happened to be Borland C++ 5.0. Having written the code and checked that a version compiled I thought I would try running it. I was about to create a project (I don't usually bother for compilation checks) when I noticed, to my surprise, that the build item in the project menu appeared in black. To my delight I found that Borland now allows the building of executables from single file source code without having to go to the bother of creating a project. I do not know how long this has been possible, but it is one more element that adds to the attractiveness of the product.

Last month's problem

Here is the code again. I have added a couple of line markers to help the discussion.

```
#include <stdio.h>
int main () {
  char c=100;  /* line A */
  int ans;
  c <<=1;      /* line B */
  ans = ~c;    /* line C */
  ans >>=1;    /* line D */
  printf ("%i", ans);
  return 0;
}
```

Note the numerical value stored in **c** at line A may be either **signed** or **unsigned**. It makes no immediate difference, but it may change the interpretation of the value stored at line B. Even if the implementation is using a **signed** version of **char**, **c** might still contain 200 at line B if the number of bits in a **char** is nine or more. Three possibilities remain for 8-bit **signed char**: -56 for two's complement negative numbers, -55 for one's complement, and -72 on a sign and value implementation.

Put those to one side, because line C does some bit twiddling where the representation of negative numbers and the number of bits in a **char** is irrelevant. After execution of line C the eight low order bits of **ans** will be **00110111**. After line D the seven low order bits of **ans** will be **0011011**. If dealing with 8-bit **char**s all the higher bits will be **0**. However, if dealing with **char**s of more than 8-bits, a large supply of alternatives is available.

We will need to know the number of bits in a **char**, the number of bits in an **int** (if the right shift is not sign preserving), whether chars are **signed** or **unsigned**, the representation of **negative** numbers for both **char**s and **int**s (I cannot find any requirement that they use the same form, though it would be strange if they were different), and whether right shift is sign preserving or not.

The answer to my question is that an 8-bit **char** implementation will output 27, regardless of other implementation details (you see – I was being kind). For implementations using a larger number of bits per **char** you will need to know a lot more about the implementation details of numerical types.

Moral: do not mix together bit twiddling with arithmetic and standard conversions.

This month's problem

This challenge is for C++ experts and it encapsulates a common misconception about initialisation in C++.

```
#include <iostream.h>
class T {
  int i;
  T(const T &T): i(t.i) {}
public:
  T (int j): i(j) {}
  void print() { cout << i << endl; return ; }
  //rest of interface
};

int main () {
  int k=5;
  T t = k;
  t.print ()
  // other code
}
```

If you find that easy, look at this variation and decide how to fix it (**class T** as before)

```
class U {
  int i;
public:
  U( int j): i(j) {};
  operator int () { return i;}  // conversion to int
  //rest of interface
};
class V {
  int i;
public:
  V(int j): i(j) {};
  operator U() { return U(i); } // conversion to U
  //rest of interface
};
int main () {
  V v = 5;
  T t = U(v);
  t.print ();
  //other code
}
```

I know this is pathological code, but complicated source can easily include this kind of problem. I wish we could persuade the Standards Committees to clean up such areas. ■

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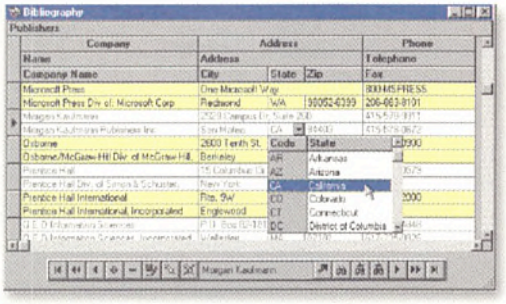

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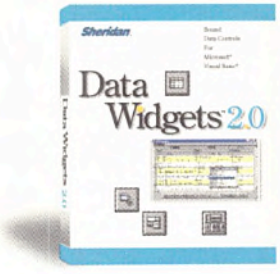

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2 Go-faster sprites

Last month **Gavin Smyth** explained how to increase the speed of sprites. In this second and last instalment he reveals some new tricks to make the little devils go even faster.

The first instalment of this article (*Spritely optimisation, EXE*, June '96) mapped the road to basic sprite drawing routines. The trail from obvious but inefficient C++ code to highly effective assembler led to extremely fast sprites, but did not arrive at a place where useful routines reside. The background of last month's sprites is drawn black, chipping holes in existing ones where they overlap, so they are not much use in video games.

To make the code viable the programmer will have to travel further along the road. What's needed is a way of specifying that only some of the pixels are to be drawn. The first obvious method is to create a second data array that indicates which pixels need to be plotted. It could be a mask array with 'zero' for transparent pixels and 'one' for sprite pixels. The inner loop in `plot()` would look like Listing 1a. It marks a return to inefficient C++, but remember the maxim 'get it working, then optimise or rewrite in assembler'.

An alternative is to reserve one of the pixel values – perhaps zero – to represent transparency. This preferable option does not require a second data vector. The resulting inner loop is shown in Listing 1b, and a more efficient assembler version of `plot()` in Listing 2. Unfortunately each pixel must be examined individually, so double and quad move instructions can't be used.

This code runs at about half the speed of the slow assembler non-masked copy. The following mechanisms will speed it up.

Run length encoding

If a number of transparent pixels are stored in a run, less time will be spent scanning past the transparent bytes. For each line, only pixels between the first and last non-zero need to be stored. The rectangular array can be dispensed with, as in Listing 3a. If a sprite's longest transparent region is 255 pixels or less, all the data can be stored in a byte string.

For the small mono sprite in Listing 3b the 'new' style data would be as shown in Listing 3c. Because the lines may vary in length the bytes must be parsed as they come. The code to plot the sprites could be the rather verbose version in Listing 3d, which shows how row and column offsets are picked up, with `sprite` pointing to the start of the data structure defined in Listing 3c. It could be made marginally faster by storing a count of the length of a row instead of the column number of the last pixel. If the sprites have long runs of the same pixel value the visible pixels could also be run length encoded, but many sprites are multi-coloured and too small to take much advantage of this.

A specific assembler version could be created for each sprite. Program fragments so far are based on one piece of code working on separate data structures for each sprite. Try forgetting this distinction. It's something that Lisp and Prolog programmers have been doing for years: treating program as data and vice versa. Identical bit patterns lie in the

Address	Usage	Number of bits	Constant
20h	Copy region width	11	no
22h	Copy region height	10	yes
24h	Destination pitch	12	yes
26h	Source pitch	12	yes
28h	Destination start address	21	no
2Ch	Source start address	21	no
30h	Copy mode	8	yes
31h	Status and control	4	no
32h	Raster operation	8	yes
34h	Transparency colour	16	yes
38h	Transparency mask	16	yes

Figure 1 – Cirrus block copy registers.

	Slow C	Fast C	Slow assembler	Fast assembler	Masked assembler
16-bit compiler	600	1200	4400	5200	2000
DJGPP compiler	1800	3700	6200	8000	2300

Figure 2 – Timing comparison: sprites per second (to two significant digits).

```
for( Coord col = _width; col > 0; col-- )
{
  if( *mask++ )
    *s = *p;
  s++;
  p++;
}
```

Listing 1a – Second array masking.

```
for( Coord col = _width; col > 0; col-- )
{
  if( *p )
    *s = *p;
  s++;
  p++;
```

Listing 1b – Transparency value = zero.

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```
void Image::plot( Coord x, Coord y ) const
{
  Pixel* s = Screen_base + y * Screen_width + x;
  const Pixel* p = _pixels;

  _asm {
      push  ds;                  // Preserve!

      les   bx,this;             // Use ES:BX as "this" pointer
      mov   ax,es:[bx]._width;   // AX is "width" (temporarily)
      mov   dx,es:[bx]._height;  // DX contains "height"
      mov   bx,Screen_width;
      sub   bx,ax;               // BX contains "offset"

      les   di,s;                // ES:DI is "s"
      lds   si,p;                // DS:SI id "p"

      push  bp;                  // Preserve!
      mov   bp,ax;               // BP contains "width"
      cld;
  }
```

```
rowloop:      // Have to come out to C(++) to define label
  _asm mov  cx,bp;              // Get the row width
colloop:
  _asm {
      lodsb;                    // Get the pixel
      and   al,al;              // Set Z flag
      jz    short skipit;
      mov   es:[di],al;         // Wasn't blank, so copy it
      }
skipit:
  _asm {
      inc   di;
      loop  colloop;
      add   di,bx;              // Move to the next row
      dec   dx;
      jnz   short rowloop;      // Finished all the rows?
      pop   bp;
      pop   ds;
  }
}
```

Listing 2 – Masked drawing routine.

computer's memory, but they are interpreted differently. Adopting this technique will result in the fastest sprite drawing, since there are no loops, tests, or even variables apart from a video memory pointer, just an instruction for each individual non-zero pixel. Listing 4a shows an example in pseudo-code. The routine can be optimised further by splitting the sprite into groups of like-coloured pixels and using register to memory instead of immediate operands, as shown in Listing 4b, or by using clever indexed addressing modes. The costs are in code size and code creation effort. Don't do it by hand (unless you really enjoy mindlessly tedious tasks). It is straightforward to create a utility to scan sprite data and produce assembler code for a drawing function.

Changing the hardware

The first hardware option is buying a faster processor, but it won't make as much difference as magic numbers like MIPS or iCOMP (Intel's measure of processor 'power') ratings might suggest.

Some graphics adapters include masked sprite drawing in hardware. One is the Cirrus 5428 device. Information on this and similar devices may be found at the Cirrus Web site, *http://www.cirrus.com*. Even if hardware drawing proves no faster than high speed assembler, it takes the load off the processor. However, the advanced capabilities of video cards and their usage are far from standardised, so it is very difficult to support a number of cards with one program. Since sprite drawing in software has to be implemented for some boards, stick with it. Besides, only high powered machines are likely to have clever video hardware, and they can cope with running the sprite drawing in software.

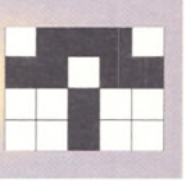
Nevertheless, as I have a device which can perform hardware sprite drawing, I will characterise its performance. It is much easier to perform video to video memory copies than system to video memory copies. I cheated in the next bit of code and drew a sprite on the screen, then used the hardware accelerator to copy it elsewhere on the screen.

```
number of lines
column of the first non-zero pixel in the line, column of the last non-zero pixel
...pixel values (including embedded zeros)...
ditto for other lines...
```

Listing 3a – Run length encoded data structure.

```
const int spriteWidth  = 5;
const int spriteHeight = 4;

static const Pixel spriteData[] = {
  {  0, 17, 17, 17,  0 },
  { 17, 17,  0, 17, 17 },
  {  0,  0, 17,  0,  0 },
  {  0,  0, 17,  0,  0 } };
```



Listing 3b – Data without run length encoding.

```
static const unsigned char sprite[] = {
  4,              // number of lines
  1, 3,           // first and last non-zero pixels in row 0
  17, 17, 17,     // row 0 data
  0, 4,           // first and last non-zero pixels in row 1
  17, 17, 0, 17, 17, // row 1 data
  2, 2,           // first and last non-zero pixels in row 2
  17,             // row 2 data
  2, 2,           // first and last non-zero pixels in row 3
  17 };           // row 3 data
```

Listing 3c – Sprite data run length coded.

```
register unsigned char* p = sprite;
unsigned char numRows = *p++;
for( unsigned char row = 0; row < numRows; row++ )
{
  unsigned char first = *p++;
  unsigned char last = *p++;
  for( unsigned char col = first; col <= last; col++ )
  {
    if( *p )
      Screen_base[ ( y + row ) * Screen_width + x + col ] = *p;
    p++;
  }
}
```

Listing 3d – Drawing function using the encoded data.

The hardware block transfer mechanism does not work very well in mode 13h because, although its video memory looks logically laid out, it is a mess internally. Each pixel addressed by the processor is actually stored in parts of four separate bytes of video memory. The hardware copy mechanism works best in linear memory modes, and so it copes very poorly with mode 13h. The VESA standard defines a number of linear graphics modes, but my BIOS does not support a linear 320 ˜ 200 mode. I changed to 800 ˜ 600 for this experiment, which was much easier to do than try to create a non-standard 320 ˜ 200 linear memory mode.

Listing 5a changes to the 800 ˜ 600 video mode, similar to the **`vidInterrupt()`** mode change routine given last time, but for VESA modes (see http://www.vesa.org).

Listing 5b initialises the hardware engine, which is controlled by a large number of registers appearing at I/O port 3CEh and 3CFh. Any access uses a write to the

```
s ← screen position
*s++ ← red
*s++ ← red
*s++ ← blue
s += skip to next non-transparent pixel
*s++ ← blue
etc.
```

Listing 4a – Pseudo-code to draw a sprite.

```
s ← screen position
a ← red (where a is a register)
*s++ ← a
*s++ ← a
etc. for the rest of the red pixels
s ← screen position + offset to first blue pixel
a ← blue
*s++ ← a
s += skip to next non-transparent pixel
*s++ ← a
etc.
```

Listing 4b – Optimised drawing routine.

```
union REGS r;
r.x.ax = 0x4F02;                // VESA set mode command
r.x.bx = 0x103;                 // 800 x 600 x 256 mode
int86( vidInt, &r, &r );
```

Listing 5a – Setting a VESA screen mode.

```
void Image::initialiseBlt() const
{
  // Make source image
  plotSlowC( 0, 0 );

  // Source and destination pitch - screen width
  outport( 0x3CE, ( Screen_width << 8 ) | 0x24 );
  outport( 0x3CE, ( Screen_width & 0xFF00 ) | 0x25 );
  outport( 0x3CE, ( Screen_width << 8 ) | 0x26 );
  outport( 0x3CE, ( Screen_width & 0xFF00 ) | 0x27 );

  // Write mode - copy source
  outport( 0x3CE, 0x0D32 );

  // Copy mode - transparency compare
  outport( 0x3CE, 0x0830 );

  // Set transparency colour = 0
  outport( 0x3CE, 0x0034 );
  outport( 0x3CE, 0x0035 );

  // Set transparency mask = 0
  outport( 0x3CE, 0x0038 );
  outport( 0x3CE, 0x0039 );
}
```

Listing 5b – Initialising the block copy hardware.

first to specify the register offset, and to the second to read or write the value. Figure 1 contains a list of the source and destination addresses, the number of bytes between the beginning of successive lines, in this case, the screen width (pitch), the number of rows and columns to copy, and the mode – transparent 'background' copy here. Many of these registers are multi-byte, and reaching them requires several byte accesses. Sophisticated Cirrus VGA controllers can map the registers into normal memory space, which permits direct long word access, and are faster than I/O operations. Alas mine does not. Because I/O operations are fairly expensive I limit them by setting the 'constants' once at the start, and updating the working registers for each sprite draw. The initialisation routine in Listing 5b paints the sprite on the screen using one of the routines presented last month.

Finally the copy is performed by the code in Listing 5c. It waits for the hardware copy engine to be free, then loads it with the source, destination, and size values before starting the copy. This will only work on Cirrus chips – and even then, probably not across the whole family.

Unfortunately this routine does not run much faster than the software masked copy. The time required scales almost linearly with the number of pixels transferred; the software overhead of all the I/O operations is negligible. A detailed examination of code timing shows about 90% of the time is wasted at the wait loop at the onset of `plotHw()`. This time could instead be used in a real application to perform non-video related processing in parallel with the screen copy.

GNU compiler

I have come across a truly superb compiler. DJ Delorie and some colleagues have done an excellent job of porting a lot of the GNU code development toolset to DOS, including the C compiler – which also compiles assembler, C++, and Objective C. It is even possible to get a DOS port of Ada based on the same system. This is a protected mode 32-bit compiler for the 80386 and above, which supports a form of virtual memory. Find the package, known as DJGPP, in the Simtel collection. A good UK location is at *ftp://sunsite.doc.ic.ac.uk-inpackages/simtel/vendors/djgpp* or head straight for the package's home at *http://www. delorie.com*. The compiler has a dedicated usenet group, *comp.os.msdos.djgpp*.

I recoded last month's programs for this compiler by changing the use of embedded assembly code and the way video memory is accessed. The latter was necessary because the 80386 in protected mode keeps code and data segments well apart from each other, so a special segment must be selected for access to any DOS memory, which includes the video RAM. The best way to do this for pixel by pixel manipulation is to select the DOS segment once using `_farsetsel()`, then reference DOS memory via `_farnspokeb()`.These functions are short inlined assembler functions that compile to one instruction each, so they do not cost much. The modified code appears in Listing 6a.

Impressive gains in speed can be had by recoding the core code in assembler, but embedding assembler within GNU C/C++ code is rather tricky for three reasons. The GNU compiler uses AT&T assembler syntax, which looks very odd to most 80x86 programmers. The operand order is swapped, and some of the instructions have slightly different names. The GNU assembler is an optimising assembler and is apparently at liberty to change the order of your code, unless you take care to explicitly tell it otherwise. Finally, it is not very well documented. Most of the GNU stuff is done on a volunteer basis.

Listing 6b contains a port of last month's slower assembly routine, with the numbers referring to the notes below.

1. When variables are defined, an attribute specifying which register to use for those variables can be added. It's much easier than trying to determine the register the compiler has chosen for the variable for use in embedded assembler. Register names begin with percent symbols, but otherwise follow normal 80386 conventions.

2. Labelling this variable as constant and assigning it to a register for later use causes a compiler error. Instead it is commented out.

3. An assembler insert has five parts: the `asm` directive; optional attributes, in this case `volatile` which prevents the compiler from reordering instructions; the assembly code itself, with statements separated by line breaks or semi-colons; a definition of outputs of the code, in this case none; a definition of the inputs and a definition of the registers touched by the code (see note 7).

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```
void Image::plotHW( Coord x, Coord y ) const
{
  register const unsigned short port = 0x3CE;

  // Wait until blitter is free
  outportb( port, 0x31 );
  while( inportb( 0x3CF ) & 1 );

  // Set up width of blt
  outport( port, ( ( _width - 1 ) << 8 ) | 0x20 );
  outport( port, 0x0021 );

  // Height of blt
  outport( port, ( ( _height - 1 ) << 8 ) | 0x22 );
  outport( port, 0x0023 );

  // Set up destination address
  register const unsigned long dest =
              (unsigned long)y * Screen_width + x;
  outport( port, (unsigned short)( dest << 8          ) |       0x28 );
  outport( port, (unsigned short)( ( dest & 0xFF00 )  ) |       0x29 );
  outport( port, (unsigned short)( ( dest & 0xF0000L ) >> 8 ) | 0x2A );

  // Set up source address - ( 0, 0 )
  outport( port, 0x002C );
  outport( port, 0x002D );
  outport( port, 0x002E );

  // Finally, start the copy
  outport( port, 0x0231 );
}
```

Listing 5c – Triggering the hardware copy.

4. Within the assembler, insert registers are referenced with two percent signs because the compiler swallows one symbol during its processing.

5. Operands are in reverse order to 'normal' 80x86 assembler. The `%w0` refers to the first argument of the input list.

6. In a similar way to the variable definition attributes, 'arguments' can be specified to pass into the assembler insert. Here they most usefully take the form of specifying the contents of a number of registers. `"a" (_width)` tells the compiler to load `this->_width` into the EAX register, so code does not have to be written to do it. The definitions are very flexible.

7. A list of the registers touched by the assembly insert lets the compiler determine which should be preserved. Few will be since the insert ends the routine. If the compiler were to add unnecessary register saves the assembler would almost certainly optimise them away. The compiler objected to the specification of ES as a register in this list, so it was removed and explicitly saved on the stack within the assembly code.

This embedded assembler looks very daunting because it is unfamiliar. When its idiosyncratic nature becomes less strange the 'argument' specification is very useful in preloading registers.

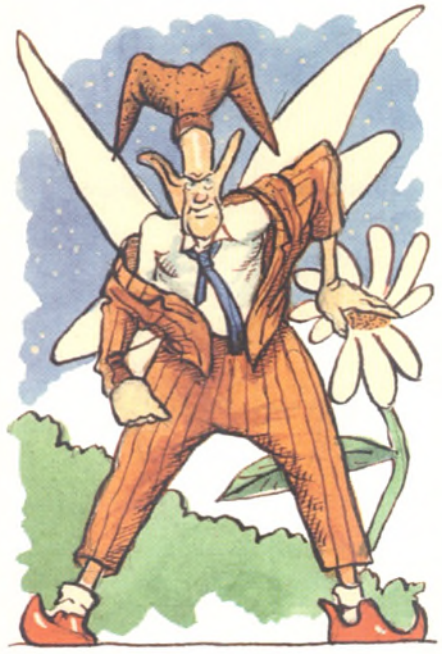
How does DJGPP compare with the 16-bit Borland compiler I used? Figure 2 contains speed comparisons of optimised code on a 486DX33. The GNU compiler has a lot of optimisation options. I didn't play with all of them, but specified `-O2` in the code used for the table. I did not enabled Borland's `fastthis` optimisation. A dramatic speed-up for C resulted, and a smaller but still measurable increase for assembler. I suspect the masked assembler differences are due to the treatment of the C parts of the code, as the assembler portions are almost identical. Unfortunately a size penalty is inflicted. The DJGPP executable is about three times as big as the Borland one, or twice as big when the symbolic debug information is removed.

```
const Coord Screen_width = 320;
const Coord Screen_height = 200;
const unsigned long Screen_base = 0xA0000;
void Image::plotSlowC( Coord x, Coord y ) const
{
  _farsetsel( _dos_ds );

  for( Coord row = 0; row < _height; row++ )
    for( Coord col = 0; col < _width; col++ )
      _farnspokeb( Screen_base +
                   ( y + row ) * Screen_width + x + col,
                    _pixels[ row * _width + col ] );
}
```

Listing 6a – Drawing routine, simple C in 32-bit mode.

```
   void Image::plotAsm( Coord x, Coord y ) const
   {
1    register unsigned long s asm( "%edi" ) =
                Screen_base + y * Screen_width + x;
2    register /*const*/ Coord offset asm( "%ebx" ) =
                Screen_width - _width;

3    asm volatile( " cld                \n"
4                  " push %%es          \n"
5                  " movw %w0,%%es      \n"
                   "rowloop:            \n"
                   " movl %%eax,%%ecx   \n"
                   " rep; movsb         \n"
                   " addl %%ebx,%%edi   \n"
                   " decl %%edx         \n"
                   " jnz  rowloop       \n"
                   " pop  %%es"
                   : /* No outputs */
6                  : "rm" (_dos_ds), "a" (_width), "d" (_height),
                     "b" (offset), "S" (_pixels), "D" (s)
7                  : "%eax", "%ebx", "%ecx", "%edx", "%esi",
                     "%edi", /*"%es",*/ "cc" );
   }
```

Listing 6b – Drawing function, assembler in 32-bits.



How fast is fast?

A notable improvement can be achieved by switching from a 16-bit to 32-bit compiler. A programmer's life is generally simpler in the flat 32-bit world than in the segmented 16-bit one. By allowing the processor to perform other functions while drawing takes place, hardware drawing has the potential for being the fastest mechanism, particularly with newer accelerator boards. Unfortunately, standards are somewhat lacking in this area, and it will be difficult to support all possibilities.

However the most significant way to speed up sprite drawing – or indeed any operation – is to apply skill as a programmer. That includes both optimising the algorithm through selection of data structures and operations on them, and optimising the implementation, which possibly involves rewriting in a more appropriate language such as assembler. Tweaking the algorithm may be time consuming, and assembly language programming is neither easy nor fun (I try to steer clear of it). But if you want your sprites to go *very* fast, get working. ■

Gavin Smyth is a real time software engineer and a part time Linux and Windows hacker.

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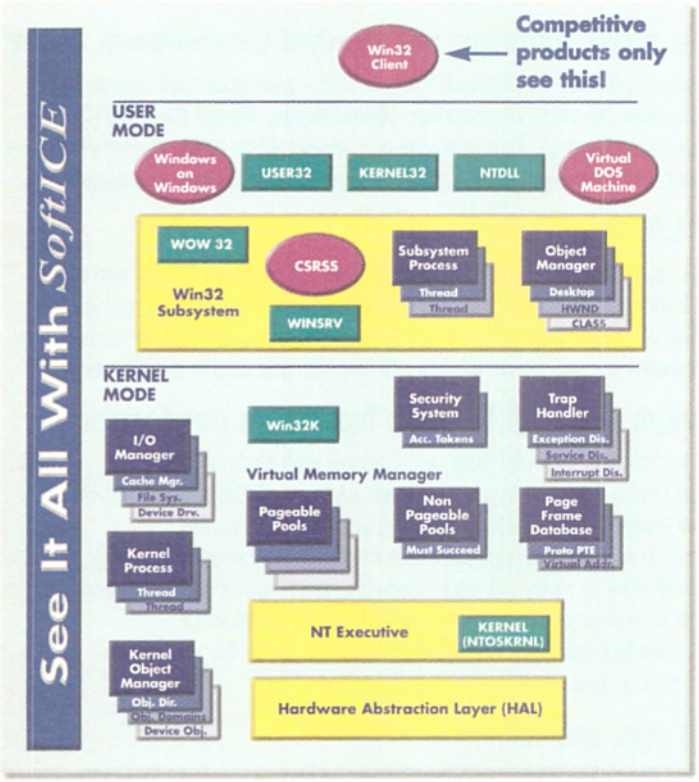

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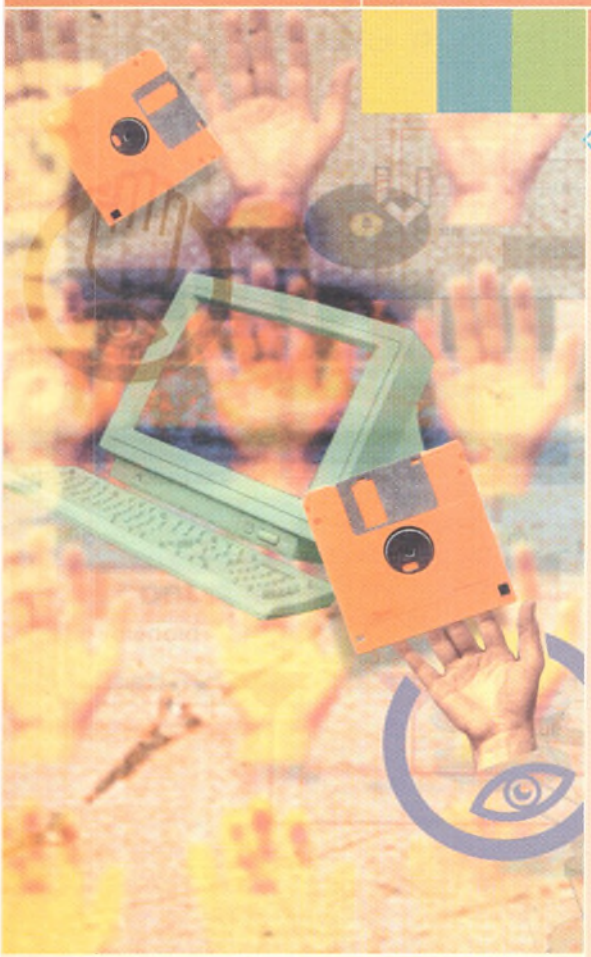

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Breaking the ICE

Using SoftICE for Windows NT V1.0 **Dave Jewell** delves into NT to debug the parts other debuggers cannot reach.

'They Said It Couldn't Be Done!' proclaims the Soft-ICE/NT setup program proudly. Until now, the NuMega Technologies debugger was available only for Windows 95 and 16-bit Windows systems. But the company behind the well-known Bounds-Checker products has a real treat for OS diers this summer. Its new version of Soft-ICE makes short work of NT's protection mechanisms, allowing easy debugging all the way down to the metal.

As hard as it gets

Mainstream program debuggers such as the integrated debugger in Visual C++ 4.1 and Borland's Turbo Debugger 5.0 have been getting steadily 'softer'. Users can easily switch away from a debugging session to read email, print off some source code, or whatever. Unlike the earliest Windows-based debuggers, these ICE (In-Circuit Emulator) tools don't take over the whole machine. Instead they behave like a conventional Windows program, benignly multitasking with any other processes running.

The strategy has advantages and disadvantages. The ability to switch away is certainly convenient. For some debugging tasks it is particularly nice to be able to debug an application which might be a client of an independently executing server. However, soft-mode debugging is a bit of a pain at times. If you actually want to 'freeze' execution of the server application along with the 'debugee' (so as to prevent a time-out from occurring, for example), a soft-mode debugger isn't going to help. By contrast, a hard-mode debugger will bring *everything* to a halt. While the execution of the debugee is interrupted, absolutely everything else stops too – except, of course, the debugger itself.

From this perspective SoftICE/NT is about as hard as it gets. A conventional debugger runs at Level 3 on the Intel processor's privilege levels, and therefore can only access application space. In contrast SoftICE runs at Level 0, and can do pretty much anything it likes! The debugger can be started in four different ways, two of which involve SoftICE loading into memory even before NT itself has finished

initialising. Effectively, because SoftICE has loaded so early, it can get its fingers into places an ordinary debugger can't reach, even the NT boot sequence.

Why would you want to do this? You may simply have an interest in seeing how NT works, but suppose you are in the business of creating device drivers, file system drivers, and other low-level software. If so, what would you do if you had a hard-to-find bug in a hard disk driver? This bug might prevent NT from booting successfully. Consequently it's imperative to be able to debug right through the boot process. SoftICE is ideal for this sort of task.

In the same way, SoftICE is ideal for debugging new video drivers or graphics intensive applications. The SoftICE debugger screen can be displayed on a separate monochrome monitor or on another machine via a serial link, making it easy to step through the code without the annoying 'flicker' effect that results when constantly swapping between graphics mode and text mode. It is even possible to use it to debug a relatively soft-mode debugger while it's debugging another program... SoftICE is 'the debugger's debugger'.

Yet SoftICE/NT is not without restrictions. It is actually implemented as a Windows NT device driver, which means it loads into memory *after* any boot drivers that may be installed. Therefore, you can't debug the NT loader or **NTDETECT** code, the **DriverEntry** initialisation code for a boot driver, or the initialisation code in the **NTOSKERNEL** and **HAL** modules – all these things take place before SoftICE gets in on the act.

Of course all this low-level power comes at a price. If you're looking for a debugger with a flashy graphical interface and a pop-up display of current program values (per Visual C++), then forget it. SoftICE has an unashamedly text-based user interface, and it is most likely to stay that way. Because this debugger operates at such a low-level, it has to be as independent of NT services as possible. Since the user might be debugging a new mouse driver SoftICE can't reasonably interact with the mouse, therefore a mouse-based interface is out.

Since SoftICE uses the processor's own debug registers, a program being debugged can run at virtually full speed – this sort of capability is great for tracking down otherwise intractable bugs.

For similar reasons none of the multitudinous SoftICE commands will initiate any disk I/O (with the exception of **HBOOT**, which reboots your PC) because the file system state can't be invasively modified by the debugger.

```
EAX=C0FDBA5C   EBX=C35200E0   ECX=C0FDBD24   EDX=C0FDBA5C   ESI=C0FDA24C
EDI=C359F068   EBP=C33EEF70   ESP=C33EED84   EIP=C0003286   o d i S z a P c
CS=0028   DS=0030   SS=0030   ES=0030   FS=0030   GS=0030   DS:C0FDBA70=00000000
                                                byte                PROT   (0)
0030:00000000 9E 0F C9 00 65 04 70 00-16 00 00 05 65 04 70 00   ....e.p.....e.p.
0030:00000010 65 04 70 00 54 FF 00 F0-FD 00 00 F0 10 EB 00 F0   e.p.T...........
     Cancel_Priority_VM_Event+0269                                      PROT32
0028:C0003299  RET
0028:C000329A  INC     EAX
0028:C000329B  JZ      C0003271
0028:C000329D  DEC     EAX
0028:C000329E  MOV     ECX,[EAX-04]
0028:C00032A1  MOV     [EDX-04],ECX
0028:C00032A4  MOV     EDX,EAX
0028:C00032A6  MOV     ECX,[EDX+14]
0028:C00032A9  TEST    ECX,ECX
0028:C00032AB  JNZ     C00032D0
0028:C00032AD  DEC     WORD PTR [C000E9F8]

0004  IntG32  0028:C0001230  DPL=3  P   VMM(01)+0230
0005  IntG32  0028:C0001240  DPL=3  P   VMM(01)+0240
0006  IntG32  0028:C00EC6ED  DPL=0  P   MYICE(01)+342D
0007  IntG32  0028:C0001260  DPL=0  P   VMM(01)+0260
0008  TaskG   0068:00000000  DPL=0  P
    Press any key to continue: ESC to cancel
```

Figure 1 – Despite what looks like a minimalist user interface, SoftICE has a powerful arsenal of debugging commands lurking under the bonnet. Those familiar with the existing Windows 3.1 or Windows 95 products will soon get the hang of the NT version.

The great thing about this 'hands-off' approach is that SoftICE can do things that ordinary debuggers can't do. Despite all the hype about robustness, most developers who program for NT have seen the 'Blue Screen of Death' on more than one occasion. With SoftICE installed the debugger is activated any time an exception is generated, allowing the developer to determine the cause of the problem.

Some like it hot

The default hot-key for invoking SoftICE is Ctrl-D. When the keys are pressed NT instantly freezes, the video display switches into text mode, and the SoftICE user interface is presented. In keeping with today's trend of giving fancy, trademarked names to perfectly common-sense capabilities, NuMega has christened this capability 'On Demand Debugging™', which means just that SoftICE can be invoked at anytime. As far as I know SoftICE is the only PC debugger which works this way, but it's certainly not a new approach. Years ago you could get an IBM PC debugger called Periscope. It used a hardware button to switch into the debugger. Similarly Apple Macintosh developers have for years used Macsbug, a resident, hardware-invoked debugger which is very similar to SoftICE in concept.

The SoftICE user interface is divided into a number of windows (see Table 1). Each is tiled (no overlapping windows here) and can be opened or closed independently, making more room for the really interesting stuff. The Data and Code windows can be resized and, if running on an EGA or VGA display, can be set to display 43, 50, or even 60 lines of text.

SoftICE will debug applications and DLLs as well. It is compatible with both 32- and 16-bit applications, and the printed documentation is up to date with information on how to prepare Visual C++ 1.5 & 4.1, Symantec C++ 7.2, and MASM 6.11 files for debugging. (At the time of writing Symantec C++ 7.2 isn't generally available). The documentation refers only to Borland C++ 4.5 and Watcom C++ 10.5, but, without reinstalling the necessary development systems to prove the point, I assume SoftICE will also be compatible with Borland C++ 5.0 and Watcom 10.6. In any event, you can download patch files

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and updates from NuMega's Web site, *http://www.numega.com*.

Both applications and drivers can be debugged at the source code level. Once software is prepared for debugging, the **WLDR** utility is used to load symbolic debug information for both 16- and 32-bit executables. Like its Windows 95 and Windows 3.1 cousins, SoftICE/NT can even be used to debug real-mode 16-bit DOS programs by employing the supplied **DLDR** (DOS Loader) utility. Some years ago I used this capability to 'de-dongle' a copy-protected software package because I'd accidentally broken the dongle off when pushing my computer too far back against the wall! The ability to debug a DOS program from a debugger running in a completely different virtual machine is very useful when dealing with copy-protection schemes which mess around with the processor's single-step interrupt vector. The great thing about SoftICE is that it is so 'transparent' from the perspective of running program. A copy-protection mechanism would have to be *very* sophisticated to determine that it was being debugged by SoftICE from another virtual machine – but I didn't tell you that!

SoftICE can be installed in one of four ways: *Boot*, which loads SoftICE as a boot driver; *System*, which loads it as a system driver; *Automatic*, which as the name implies loads SoftICE as an 'automatic' driver once system-level initialisation is complete; or *Manual*, in which mode SoftICE can be started manually from NT when required.

The user interface is based around a series of commands such as **BC** (breakpoint clear) and **EXP** (show exported symbols). Simple editing capabilities are provided (the up arrow returns the previous command line), and command sequences can be allocated to function keys. It takes a while to get the hang of all the commands, but

It is even possible to use it to debug a relatively soft-mode debugger while it's debugging another program... SoftICE is 'the debugger's debugger'.

SoftICE helps. As each letter is typed, a list of the available commands which are prefixed with that letter appears. A very simple on-line help facility lists all the possible commands SoftICE can accept. Several other built-in help facilities make life easier for the programmer. For instance typing

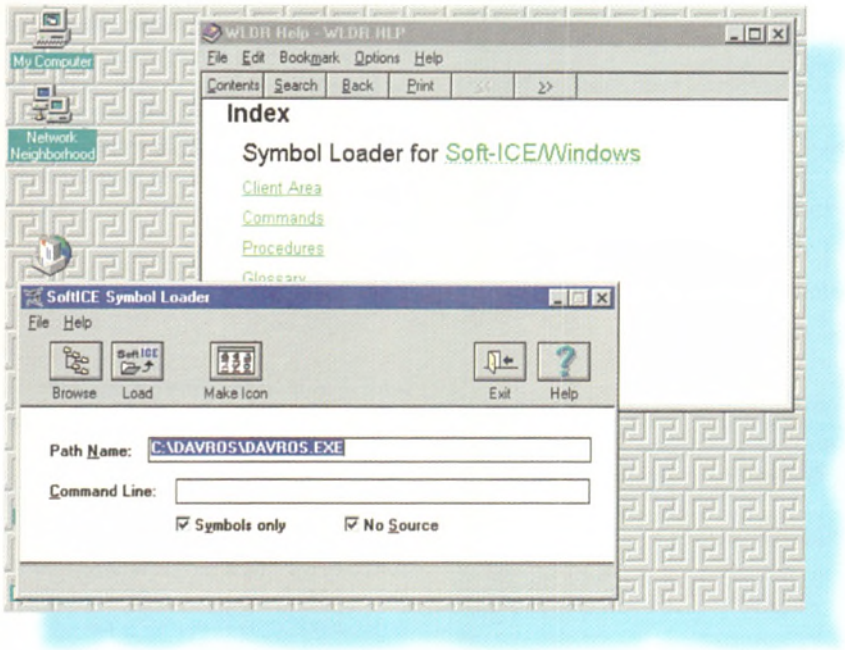

Figure 2 – The most important SoftICE utility is WLDR. It allows the user to begin debugging a specified executable from within SoftICE. Obviously, this utility is not needed if your main interest is in poking around within the OS internals.

WMSG WM_SET* will cause SoftICE to print out a list of all Windows messages that begin with **WM_SET**, with each message name listed beside the corresponding message number. Conversely, if a message number is known but the name is a mystery, **WMSG** will solve the problem.

SoftICE is particularly rich in its breakpoint capabilities. Breakpoints can be set on a specific memory address (including code in the internals of NT itself) or on a memory access. A breakpoint can also be set on access to a range of memory, on an exception, or on an interrupt. Breakpoint handling can be 'fine tuned' in many ways. For example, when breakpointing a range of memory, it is possible to specify the type of memory access desired. Suppose something is stamping on constant string data in a program. By using the **BPR** command and specifying the **W** (memory write) verb, SoftICE will instantly trigger whenever the memory is modified. Since SoftICE uses the processor's own debug registers, a program being debugged in this way can run at virtually full speed – this sort of capability is great for tracking down otherwise intractable bugs.

When triggering a breakpoint SoftICE allows the user to precisely control the circumstances under which the trigger occurs. Rather than laboriously describing all the possibilities, I've derived a few examples from the documentation which are shown in Table 2, along with a short description of what is intended in each case.

The ability to specify that the debugger is triggered when a certain window receives a specific Windows message, as in the last example, is very useful. Another nice feature of SoftICE is its built-in macro facility. Using the **Macro** command named macros can be defined which accept up to eight different parameters of the form **%1**, **%2**, etc. With the right arrangements a macro can be called in response to a break condition.

Manual labour

The SoftICE documentation is divided into a user manual and a command reference. The former is particularly interesting, and provides a rare insight into some of the inner workings of Windows NT. Authors such as Andrew Schulman and Matt Pietrek have done a lot to demystify the deeper recesses of

Windows 3.1/95, but Windows NT is still a relatively unknown 'black box'. Pietrek now works for NuMega, and I don't doubt he had a hand in 'spelunking' some of the information presented in the SoftICE user manual.

One case is the documentation's fascinating discussion of the Windows NT 'Handle Manager'. The feature manages the allocation of handles on behalf of the higher-level **USER/GDI** code, which needs to return a handle to the application layer. Building on the knowledge it has of NT internals NuMega included a number of debugger commands which allow direct examination of these hitherto undocumented data structures. For example the **OBJTAB** command can be used to display a list of all entries in the master object-handle table.

Because SoftICE operates at such a low level it is sensitive to the hardware it runs on. I've already mentioned that SoftICE can't risk using the installed Windows video driver for fear of disturbing the state of something it is trying to debug. For this reason the debugger uses its own video drivers. When SoftICE is first installed it asks what sort of display card is being used, then a quick test is run (using the SoftICE code) to establish if it is indeed compatible with the installed hardware. In practice I had some difficulties with this for a variety of reasons. First I was using a pre-release version of SoftICE; second I was using a beta version of Windows NT 4.0; third I was running an Imagine 128 card without Number Nine drivers for NT 4.0. It is therefore not surprising that SoftICE got a bit confused. I expect these difficulties to be fully resolved with the shipping versions of SoftICE, NT 4.0, and the Number Nine video drivers. However, in the unlikely event that you *do* have problems with your particular card, you can always run the system in 'generic VGA' mode. The best solution, of course, is to use a serial link or a secondary monochrome adapter.

Despite all the hype about robustness, most developers who program for NT have seen the 'Blue Screen of Death' on more than one occasion.

To the bare metal

SoftICE/NT is a very powerful debugger which is ideal for system-level work under Windows NT. Although the user interface is necessarily somewhat crude, a wealth of functionality is available through the various commands – the breakpoint triggering facilities are particularly impressive. If you are developing drivers, services, or other 'system-level' components, you will find SoftICE virtually indispensable. It brings many of the benefits of a harder ICE package, without the attendant costs and hassle. If you develop applications, SoftICE has a great deal to offer, particularly where a 'hard mode' debugger is required for debugging real-time applications, or where it is vital for the entire system to be 'frozen' during the debugging process. And if, like many others, you simply want a sophisticated tool for poking around inside the innards of Windows NT, you will be in paradise with SoftICE/NT! Be warned though, once you've disappeared into the inner depths of **NTOSKRNL**, you may never be seen again... ■

Command window	For entry of user commands and displays information
Code window	Shows source code and/or disassembled CPU instructions
Data window	For displaying and editing memory
Watch window	Shows current values of any variables being 'watched'
Register window	Displays CPU registers and flags
FPU Stack	Shows state of floating point coprocessor (if any)

Table 1 – The SoftICE user interface is divided up into a number of windows.

`BPMW MyVar W IF MyVar==7`	Break if the value 7 is written to the word-sized variable **MyVar**. Byte and double-word sized variables can also be specified
`BPINT 2F IF EAX==73h`	Break on an INT $2F interrupt if EAX equals 73h.
`BPIO 2FE R IF (AL & 80)==80`	Break if a read of port 2FEh returns with bit 7 set.
`BMSG 1002Ch WM_CLOSE`	Break on window handle 1002Ch when **WM_CLOSE** received.

Table 2 – When triggering a breakpoint, SoftICE allows you to precisely control the circumstances under which the trigger occurs.

Dave Jewell is a freelance consultant, programmer, and technical author. You can contact him at DSJewell@aol.com, 102354.1572@compuserve.com, or DaveJewell@msn.com.

SoftICE/NT has a recommended retail price of £539. However, QBS Software (0181 956 8000) is offering it for £495. System Science (0171 833 1022) has an upgrade program at £395, standard price being £525. SoftICE/NT can also be obtained from Grey Matter (01364 654 100) for £555.

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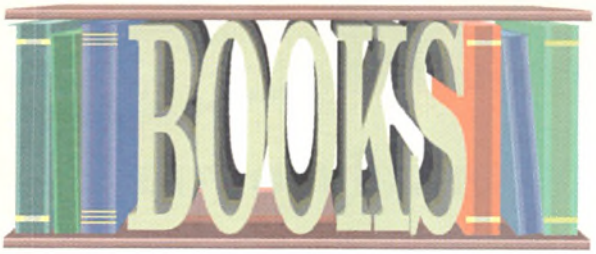


The Mitnick papers

Three books, one story. **Adrian Leonard** asks 'why are the authors part of the plot?'

The Kevin Mitnick story has everything a good book needs: heroes and villains, a cyberspace chase scene, even a perilous threat to international security. Plenty of scribes were close to the material; three books were published shortly after Mitnick's January trial.

Yet I'm confused by these divergent works about the man's life, misdeeds, and final arrest. Is the villain Mitnick, the notorious hacker and master of 'social engineering', or is it Tsutomu Shimomura, the cocky LA ski instructor who chased him down with illegal cellular-phone monitoring gear? Or is it John Markoff, the *New York Times* reporter who published the myths that made Mitnick the most wanted hacker in cyberspace and participated in his capture? Is it Jon Littman, the writer Mitnick telephoned again and again while on the run? Except for Jeff Goodell, the *Rolling Stone* reporter who penned *The Cyberthief and the Samurai*, each of the authors of the books is an important player in the plot.

Mitnick was a small-time hacker. He never made any money from his hobby, but he did make headlines. He served some hard prison time, and is doing more now. His tragic flaw was his choice of enemies: Shimomura and Markoff, the duo that eventually wrote *Takedown*. An unknown assailant launched an IP spoofing attack on Shimomura's home LAN on Christmas Day, 1994. The pair teamed up to catch the hacker responsible, and meanwhile made enough media noise to renew public interest in the Kevin Mitnick saga.

Markoff had been tracking the Mitnick story for years. He co-wrote the book *Cyberpunk*, which included a section on Mitnick called *The Dark Side Hacker*. Mitnick maintains the work is '20% false and libellous', but it elevated the young man from an innocuous hacker to one of America's most wanted. Markoff also wrote several articles about Mitnick for the *Times*. Most began by mentioning that Mitnick had 20,000 stolen credit cards numbers, but the admission that he never used them was buried. Markoff failed to reveal that the list is common property among hackers. His sensationalism continued to the bitter end. In a *Times* article that appeared the day after Mitnick's arrest, he reported that in a final act Mitnick 'nearly destroyed' the Internet provider The Well. In reality, only a portion of one day's accounting records was destroyed.

All in all, the journalist got a tremendous amount of mileage out of his sensational Mitnick story – and made a lot more money from the hacks than his subject did. 'I've thought about trying to catch Kevin, but I guess that wouldn't be politically correct,' Markoff mused to Littman, long before Markoff wrote *Takedown* or Littman wrote *The Fugitive Game*.

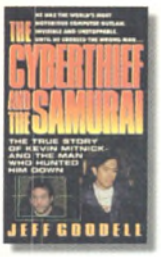
Later, however, Markoff did help capture Mitnick. The journalist insists he was present on the hunt as an observer only, but interviews in *The Fugitive Game* and *Cyberthief* with other members of Shimomura's search team tell otherwise. Ultimately Markoff and Shimomura landed a $700,000 book contract for *Takedown*, plus more cash from Mirimax for movie rights and a CD-ROM game. Shimomura was elevated from an obscure techie to the most sought-after computer security expert around.

Passages in *The Fugitive Game* and *Cyberthief* hint the duo chased Mitnick to make their book more exciting. The two books do reveal sub-plots of the Mitnick story that *Takedown* fails to mention. It does not cover Shimomura's long friendship with Markoff ('I'm pretty close to Shimo', Markoff told Littman), or that the 'security expert' once apparently shared an apartment with Mark Lottor, the indicted fellow hacker who's illegal phreaking exploits Markoff wrote about in *Wired*. *Takedown* does say Shimomura 'worked with Mark *[Lottor]* on cellular telephone software', but it doesn't say why. The book avoids completely Shimomura's own alleged history as a phone phreaker and hacker. Goodell asked him 'have you ever cracked a computer system?' Shimomura said 'I did hack some systems... I don't want to talk about that'.

Takedown doesn't mention an *earlier* attack on Shimomura's computers – an attack in which many of the same files were stolen, according to Capt Kevin J. Ziese of US Airforce Information Warfare Center. Shimomura does not admit that he omitted common security precautions on his home system like disabling Finger and remote log-in commands. Markoff's comment to Littman 'It is not impossible that *[Shimomura's computer]* was a bait machine...' was left out of *Takedown*. An excellent explanation of how to conduct an IP spoofing attack is included, should anyone wish to learn.

Most of *Takedown* comprises Shimomura's description of the processes he used to determine who hacked into his home computers on Christmas Day, but in the end he might have got it wrong. Shimomura and Markoff do report that several taunting phone messages (which Shimomura had attributed to Mitnick and put on the Web) continued after Mitnick was locked up and refused a telephone. Littman concludes that perhaps it wasn't Mitnick who did the Christmas hack – Markoff told him the evidence overwhelmingly pointed away from Mitnick. Even Shimomura concedes that Mitnick wasn't quite up to it technically.

Guilty or not, a snippet of Mitnick's Internet chat reveals the irony of the case: 'a reporter doesn't HELP catch someone its not ethical. he is the reason why my picture was the front page of the new york times' *[sic]*.



Title: *The Cyberthief and the Samurai*
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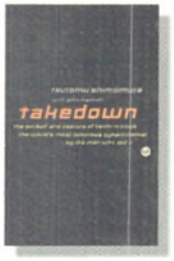
Verdict: *A thorough and unbiased account*



Title: *Takedown*
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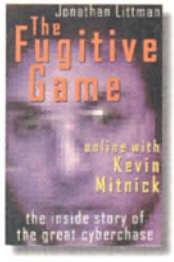

Title: *The Fugitive Game*
Author: *Jon Littman*
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Verdict: *The best glimpse of Mitnick's persona*

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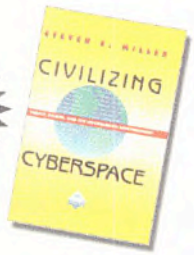

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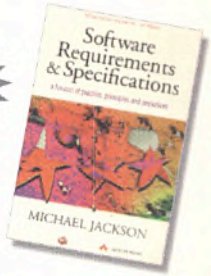

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Civilising Cyberspace	£22.95	£18.35
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Descriptions of all books below can be found in *EXE Magazine*, August 95 to July 96

Selection	RRP	Your Price	Month
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Database Developer's Guide with Delphi 2	£49.95	£39.96	July 96
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JOB		JOB		JOB	
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A highly successfully Software House is looking to recruit several Sybase Programmers. Applicants must have a minimum of one years Sybase 4.9 and/or Sybase 10 programming experience, coupled with some UNIX/'C'. The successful candidates will be involved in the design and development of a variety of financial systems, so any experience of applications such as Insurance, Pensions or Banking would be a bonus. Highly competitive remuneration packages on offer. REF: PP/1		Our client is searching for highly professional and committed Software Engineers with a minimum of one years experience of writing 'C' code under UNIX. Any experience of C++ and OOD would be advantageous. The ideal candidates will have experience of working in a large, well structured development environment. There are also opportunities for those Software Engineers with experience of real-time embedded software systems. Successful candidates will be working on leading edge network management systems. There is also the opportunity for limited European travel. REF: DE/2		Blue-chip Software House has immediate requirements for two Programmers, two Analyst Programmers and a Technical Consultant with strong Oracle skills. Upwards of one years' Oracle V6.0 or V7.0 and SQL*Forms V3.0, V4.0 or V4.53 experience is essential for these positions. A variety of new development work is available in the areas of Finance, Retail and Medical applications. Applicants must be prepared to work on client site and therefore should possess strong inter-personal skills. Excellent training and highly competitive salaries are on offer. REF: PP/3	
JOB		**JOB**		**JOB**	
UNIX SYSTEM ADMINISTRATOR		INGRES DEVELOPERS		'C'/UNIX/LOW LEVEL	
LOCATION	**SALARY**	**LOCATION**	**SALARY**	**LOCATION**	**SALARY**
City	To £30K	London	To £30K	Berks	£20K - £40K
This international investment brokerage has a requirement for a UNIX Systems Administrator. Candidates will have a sound UNIX systems administration background along with some networking skills, preferably TCP/IP. Any banking or other financial applications experience would be advantageous, but is not essential. An interest in the Internet would also be useful. A flexible and friendly working attitude and the ability to react quickly in a fast moving environment is essential. REF: JK/4		Our client, due to their continued success in Open Systems Technology, in particular in the Ingres world, has urgent requirements for Ingres developers. Candidates must have at least 12 months Ingres development experience including 'C', SQL, ESQL and ABF with any knowledge of Ingres/Windows 4GL being advantageous. You will be building technically demanding Ingres based solutions and must possess the ability to progress into a more design/consultancy orientated role. Superb opportunities in terms of technical content and career prospects. REF: PP/5		Our client, a major player in the world of computing are seeking talented system level engineers. Essential requirements are a solid knowledge of 'C' programming in a UNIX environment, preferably to kernel level. Experience of any of the following would also be of interest; network management software, communications and/or device drivers. Opportunities exist in several areas and would suit software engineers wishing to work at the forefront of the telecommunications industry. Candidates must be strongly team motivated, flexible and above all enjoy software engineering. REF: JK/6	

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Ctrl Break

Send your rants and raves and interesting tales to: EXE Magazine, 50 Poland Street, London W1V 4AX email: editorial@dotexe.demon.co.uk

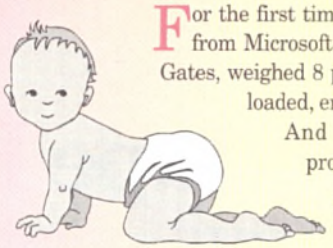
Frog

Ctrl-Brk received this short story (culled from Usenet) and liked it so much that we're sharing it with you:

A boy was crossing the road when a frog called out to him, 'I am a beautiful Princess, if you kiss me I will be ever so grateful.' The boy picked up the frog, smiled at it and put it in his pocket. The frog said 'If you kiss me I will stay with you for one week' The boy took the frog out of his pocket, smiled at it and put it back.

The frog said 'If you kiss me I will do anything you want' The boy took the frog out, smiled at it and put it back. Finally the frog said 'Look, what is it with you? I told you I am a beautiful Princess, I will stay with you for one week and I will do anything you want. Why won't you kiss me?' The boy took out the frog, smiled at it and said 'Look, I am a computer programmer, I don't have time for girls but a talking frog is really cool!'

Press release



For the first time in, oh, a decade, I think, something from Microsoft shipped on time: Jennifer Katharine Gates, weighed 8 pounds 6 ounces when she was downloaded, er, born on Friday, April 26 at 6:11 p.m. And what do Baby Gates and Daddy's products have in common?

1. Neither can stand on its own two feet without a lot of third party support.
2. Both barf all over themselves regularly.
3. Regardless of the problem, calling Microsoft Technical Support will not help.
4. As they mature, we pray that they will be better than that which preceded them.
5. At first release they're relatively compact, but they seem to grow and grow and grow with each passing year.
6. Although announced with great fanfare, pretty much anyone could have produced one.
7. They arrive in shaky condition with inadequate documentation.
8. No matter what, it takes several months between the announcement and the actual release.
9. Bill gets the credit, but someone else did most of the work.
10. For at least the next year, they'll suck.

Ctrl-Brk checked all the facts with Text 100, Microsoft's PR agency. Has anyone seen the Q&A issued by Microsoft Corp for the occasion?

Hung

Having just installed Windows NT 4 (build 1234) on my Windows 95 system, I thought I would see how much of NT would actually run under '95.

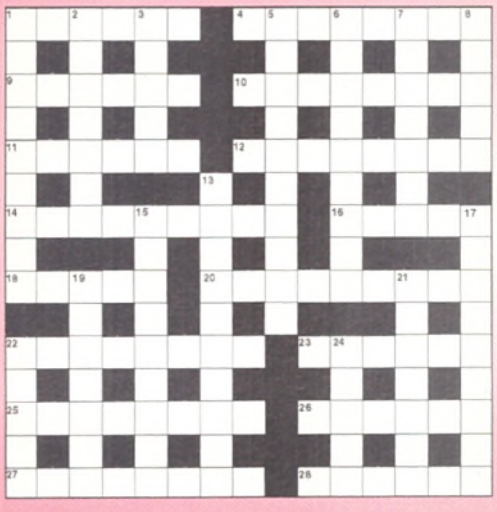
Out of curiosity, I tried NT Explorer and received the following message:

```
Error Starting Program
The EXPLORER.EXE file is linked to missing export
USER32.DLL: IsHungAppWindow
```

Which lead me to wondering – why should it matter to Explorer how well endowed my Windows are?

Contributed by Jolyon Smith <jsmith@platinum.com>

CROSSWORD



ACROSS

1. Light particle ... (6)
4. ... to do with heavy particles, such a one on a chip (8)
9. Little wave on a larger signal (6)
10. Wasted liquid from time of splints (8)
11. Muse is inside to employ incorrectly (6)
12. Of Francis' scientific method (8)
14. Signals of high water (9)
16. Entered a block of metal (5)
18. Long wave em radiation and a system using it (5)
20. Logic circuits with no effect? (4,5)
22. Non-relative as the true zero (8)
23. Micro-micro for cuddling? (6)
25. Pass on responsibility to the rep (8)
26. Catch with a two-way snare (6)
27. High-frequency mechanical oscillators (8)
28. Variable contact with low friction ... (6)

DOWN

1. ... and not so variable variable (9)
2. Equal and opposite (7)
3. Looks leeringly (5)
5. Human resource assessments (10)
6. Moving to about 600 nm and shout as money due (9)
7. Getting close to sense with new beginning (7)
8. Many thin chip makers have such rooms (5)
13. @sum of @sums? (5,5)
15. Secondary radiation as we work on the side (9)
17. Litmus set of exam questions (4,5)
19. Show the monitor (7)
21. Taught individually? (7)
22. Submarine sensor initially a super detector of incoming current (5)
24. Make zero (5)

SOLUTION TO JULY'S CROSSWORD

ACROSS:
1. REMARK 4. DECLARED 9. GREASY
10. OFFSHOOT 11. STORES 12. SCANNING
14. EXIGENCIES 18. BENCHMARKS
22. PROGRESS 23. CLAUSE 24. TRANSMIT
25. STRESS 26. YODELLED 27. EDITED

DOWN:
1. REGISTER 2. MNEMONIC 3. ROSTERED
5. EFFICIENCY 6. LOSING 7. ROOKIE 8. DOTAGE
13. ACCESSTIME 15. EMULATED 16. ARGUMENT
17. ASSESSED 19. APATHY 20. POLAND
21. CRESOL

The Screwtape Email

Ms Stob has been temping as a tech support operative, a job for which she is temperamentally entirely unsuited. Here are the notes she left for her successor. Tech support is like medical care on the National Health. Everybody believes he is entitled to as much of it as he needs when he needs it, yet nobody is prepared to pay for it.

As a tech support person, you are at war with the punter. The spoils the victor will claim is your time. The punter knows that all your time belongs to him as a birthright, although he has no use for it.

For example, you will many times phone a punter back, having spent an hour or two working through his problem, and he will say 'Oh, I solved that by myself a few minutes after you rang off last time. But while you are on, I'm now having problems with...' When this happens you must brightly agree to look into the new problem, and tear up the Post-It note on which his number is written as soon as you replace the receiver. This is the only acceptable course of action and you must always do it.

All punters believe that you are working only on their problem, and have nothing else to do. If you do have other work, you are only doing it to vex them. 'I phoned 20 minutes ago, and still nobody has got back to me...' You will spend 10 minutes calming them, and explaining that you will get round to their problem as soon as you can. When you put the phone down, it will ring again immediately, and it will be the person whose problem you were working on before being interrupted, wanting to know why you haven't got back to him.

Listen carefully for meta-meanings. Suppose the punter says: I know what I'm talking about; I have a degree (or HND, or MSc, or whatever – the actual qualification is immaterial) in Computer Science/Information Technology/Nuclear Physics. Then he is trying to tell you that he is a technophobic, incompetent snob with an inferiority complex and a set of unshiftable, ill-informed prejudices, who will not take the advice he is ringing for.

Or suppose the punter says: I trust you will put your back into this, we have spent/are about to spend a lot of money with you. Then he is trying to tell you that he is a parsimonious, whinging swindler who has never settled a bill in less than 120 days and who will never spend more than £50 with your outfit.

Or suppose the punter says: We write software here, and I can tell you our programs never have faults like this in them. Then he is trying to tell you that he indulges in self-abuse, and has become, through practice, so proficient that he has defeated all comers in several self-abuse competitions at international level.

The cheaper the product, the more technical support it attracts. You will get more calls per copy for a £15 piece of shareware than for Oracle 7 for Big Mainframe.

If you know the solution to a problem, don't blurt it out at once: call them back two days later. Don't train punters to rely on you instead of thinking for themselves.

Installation programs almost never work.

If someone phones up from a car phone, or while they are eating (gulp, chew, gurgle), you are permitted by the UN Convention of Human Rights to say, '...but I can tell it's a bad time – call back when you have finished your journey/meal' and hang up swiftly before they tumble.

When a product is working, it was written by Microsoft/Borland/Corel/whoever. When it isn't, it was written by you. Personally. 'I am having trouble editing the registry in your Windows 95.'

Never answer before the third ring – they may suffer a stroke on the second. ■

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Final Score	**8.5**	6.5

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