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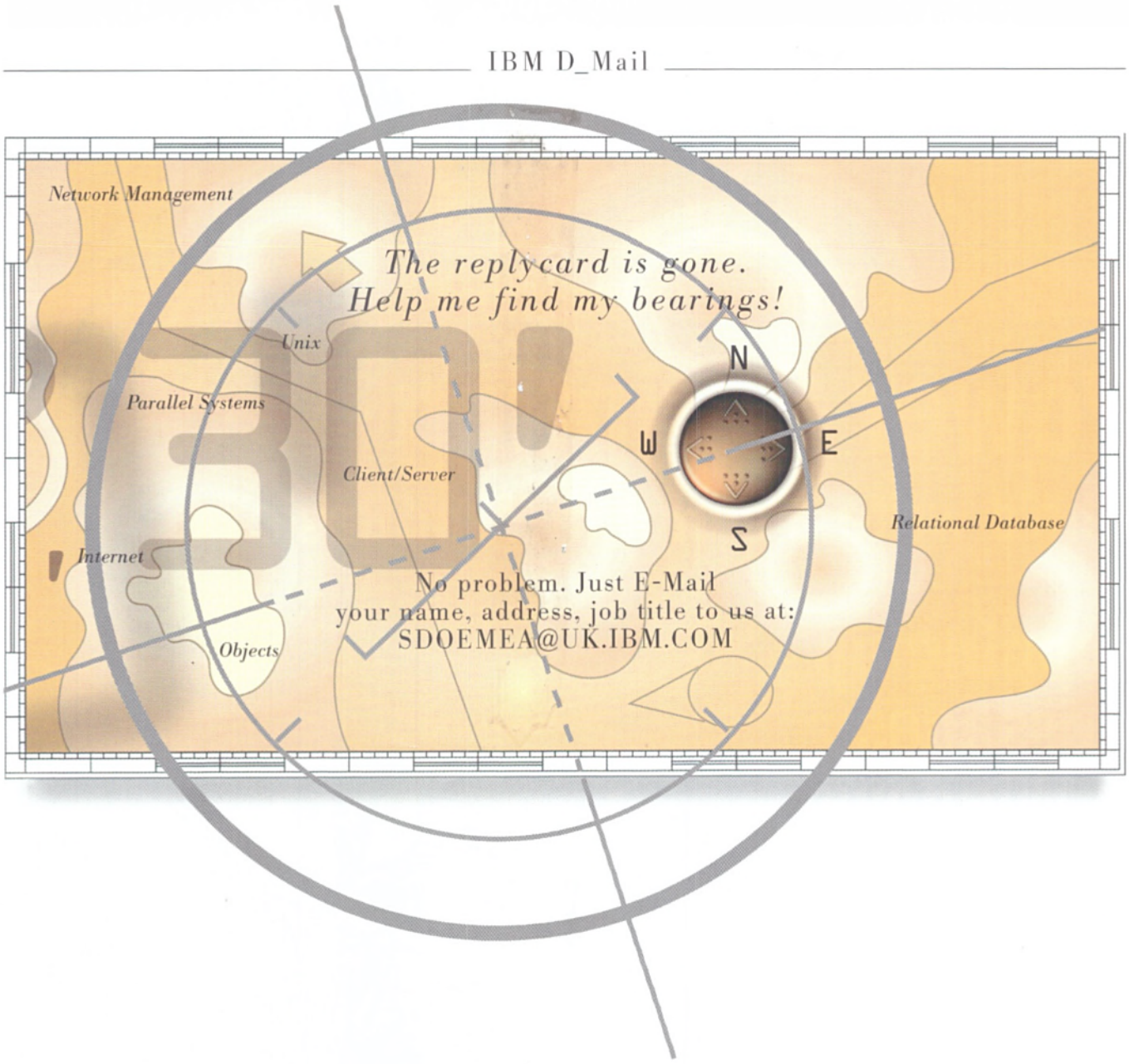

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News & Views

VisualAge for C++ for Windows

The State of the Art Redefined

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- **Data Access Builder** maps SQL tables to C++ classes, generating C++ & SQL code. Supports Oracle & Sybase (ODBC) as well as DB2
- **Direct-to-SOM** generates SOM objects direct from C++ code

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Oberon/F

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If you are allergic to C++, call us now

JFactory

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Symantec Café

Visual Java?

This is the first Win32-hosted tool devoted exclusively to Java, and includes everything you need to write & debug Java apps & applets:

- **Café Desktop IDE** with project manager, class editor, hierarchy editor, syntax-highlighting editor
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AM Builder, the entry level version, only costs £195. Why not call us to find out more. Also ask about AMazon, their new tool that connects Web servers to your corporate data.

SoapFlakes

The language of the next millennium

The study of the evolution of human language is indeed a complex but fascinating one spanning thousands of years. Human communication has developed from early symbolic graphics, such as cave drawings and hieroglyphics, to a more intricate written and vocalised form, which is as diverse as it is complex. One needs only to compare the Roman alphabet with the Hebrew to see this. However, all languages are based on clear structures from which rules and standards have been developed. We do not rely on just the spoken language as the only medium of communication, but have continued to enhance language with symbolic or expressive drawings and diagrams. Without standards we would communicate less effectively. Without graphics we would lose the clarity of symbolism and the power of expression in our language. The language of the spoken word and the graphic has merged to produce a rich form of communication.

But what of the programming language? What will be the history and evolution of the language of computers? Take the debate between compiled and interpreted languages for example. Is one better than the other, or just better placed in certain situations? Are these languages mutually exclusive? Is there no synergy between the two, such as those between the spoken word and the graphic in human language?

Interpreted programming languages, such as LISP, were favoured in Artificial Intelligence (AI), where researchers wished to express theories richly and in plain English. The rules embedded in AI applications are statements clearly understood by researchers. The way an application works is based on knowledge elicited from an expert, who will talk in a natural and expressive way, not in a programming language. This was all well and good for the academic world of research where the need for a strongly-typed and non-restrictive language which enabled rapid prototyping and proof of concepts was paramount. However, as these new and exciting applications found their place in the commercial world the costly overheads, engendered by the slower and less demanding applications, and the proprietary nature, gave rise to the need for a faster and re-usable programming language.

Industries where change happens rapidly, such as the telecomms industry, require real-time applications which cannot be developed using interpreted language. The parsing and compiling of strongly typed languages into machine code make applications quicker to execute and more responsive to external events. The majority of telecomms companies operate under harsh contractual arrangements where responsiveness and network availability is high on their priority list. Network infrastructure applications developed for driving and supporting the network are evolving at an ever increasing rate so the need to completely reconfigure the network without compromising on security and availability is becoming more of an issue. This issue has been addressed by incorporating highly functional pre-compiled and tested class libraries in the life-cycle of application development. In fact, it is true to say that such applications are required in an increasing number of industries as the pace of economic and industrial change increases.

The emergence of the Internet has made available a global open network rich in potential for applications. However, at first there was no language which enabled easy development. Therefore, Java was created – a quick and simple language fashioned for application development on the Web. Powerful and easy to use, Java code is developed using a dynamic language which itself is interpreted. Without doubt, Java is excellent for building applets which can then be used for simple Internet application development. But what of the requirements of large corporations for enterprise-strength, truly scaleable applications? For such Internet development, software developers need the combination of the speed, efficiency, portability and standards which a compiled language such as C++ can bring, together with the simplicity of Java. The Java and C++ experts are already on the case and rapidly developing an interface or 'gateway' between the two languages to achieve a much needed synergy. Computer languages are indeed evolving rapidly. What will the next millennium hold for software development? Will standards unify and one 'super-language' develop? And will the computer achieve this before man, I wonder?

Desmond DeLandro is Technical Director at ILOG UK, a C++ supplier of software components. DeLandro can be contacted on 01344 426666.

What is the value of software?

In *The Triumph of the Nerds* on Channel 4, we had the rare opportunity of seeing Bill Gates and Paul Allen talking about the development of their 4 KB Basic for the Altair 8800 computer, and Dan Bricklin and Bob Frankston on Visicalc. One major difference between these two pieces of software: one was intellectually protected, the other was not. Bricklin and Frankston believed that it would help others to take ideas from Visicalc, and on this level it was a success. Nearly twenty years later, Microsoft through the EMWAC initiative is helping to create freeware (albeit for one of its commercial OSs). Is this a sign of a return to the highly ethical values of the true hackers?

David Mery

Mayhem!

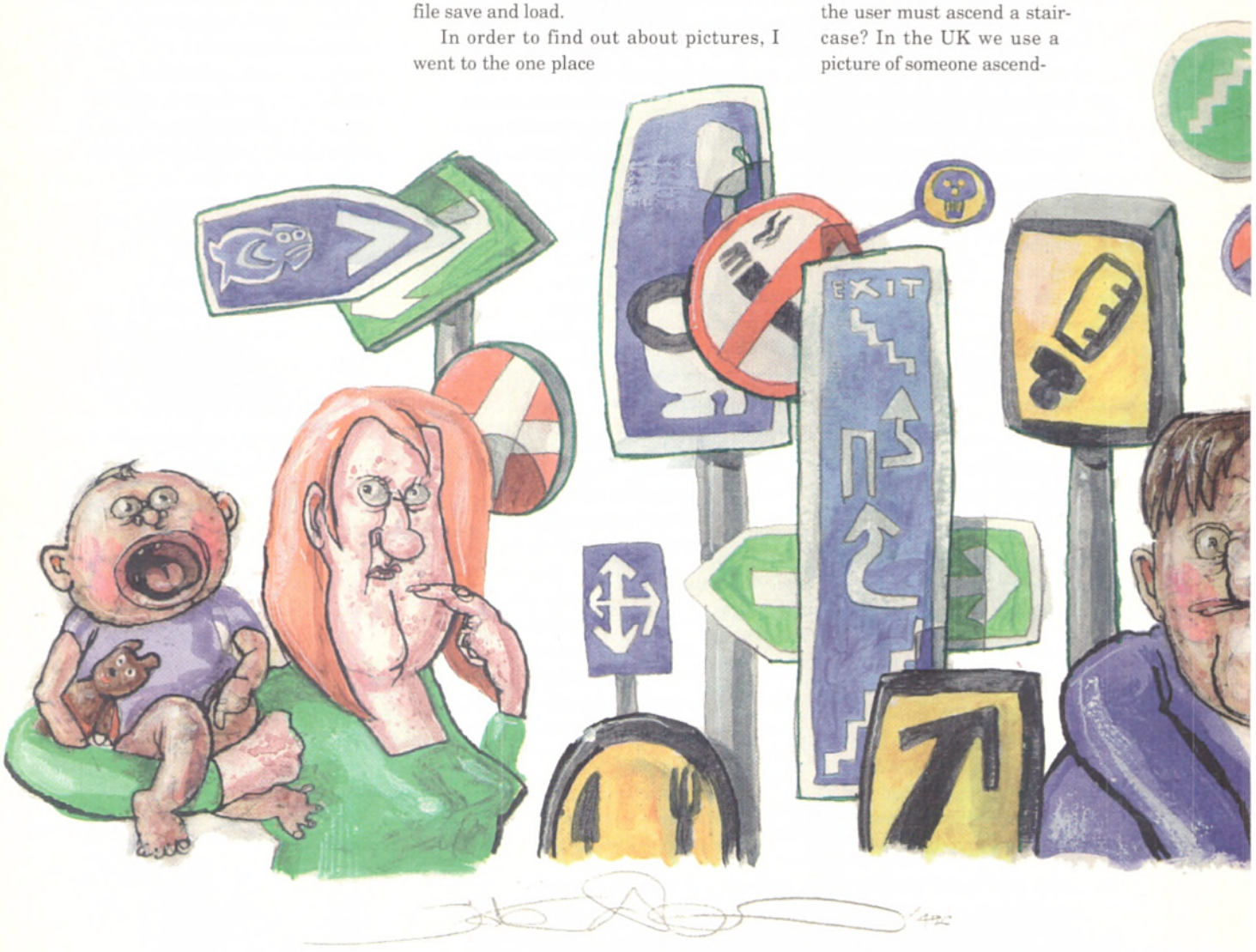
A picture is worth a thousand words. **Jules May** finds this common sense confusing to say the least.

'There are too many words on the buttons' said the client. 'Put pictures on instead. Pictures take up less space, and besides, they don't need to be translated'.

I'm sure it's a better idea to use pictures than words, but somehow, pictures never seem to work right. I detest the programs that display millions of pretty-coloured buttons, because it all just blurs into a mess of confetti. It's also quite hard to come up with meaningful pictures for buttons – you can see there's no standardisation for basic operations like cut, copy and paste, or even file save and load.

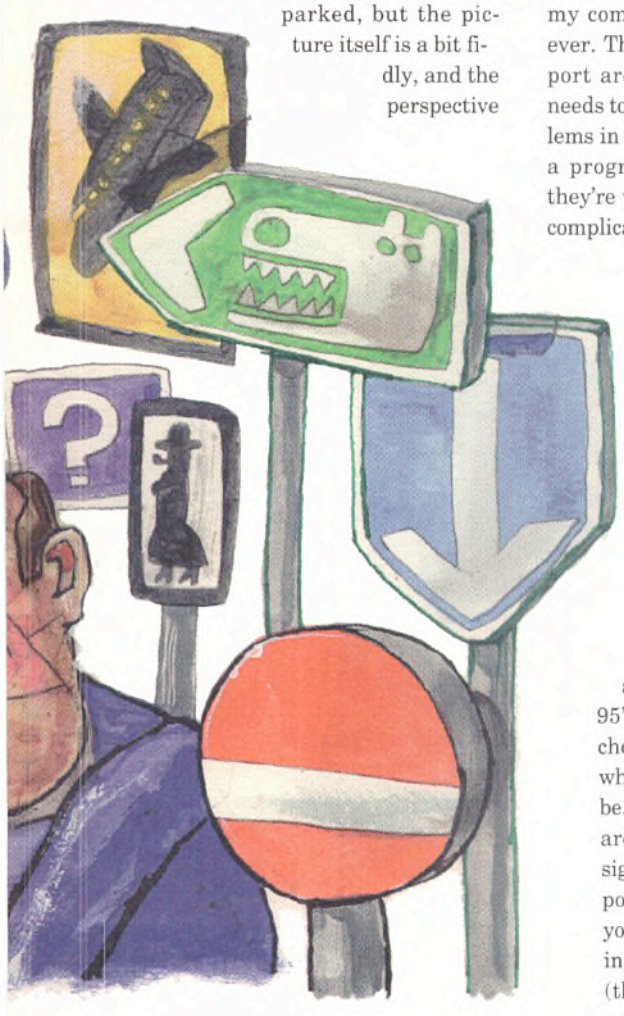
In order to find out about pictures, I went to the one place in the world where pictures are absolutely essential for communication; an airport. Airports are complex buildings, with complex operating modes, and you can bet that at least half the people in them cannot read the native language.

Direction signs start off easily enough. Arrows are pretty standard direction indicators, so you can make an arrow point out where something is – provided that you can identify the something. But even here there's a problem. The signs are two-dimensional, and an airport usually has many levels. Straight on is indicated by an arrow pointing upwards, but what if the user must ascend a staircase? In the UK we use a picture of someone ascend-



ing a staircase, but you can only see the difference if the two symbols appear next to each other. Presumably, then, an arrow pointing downwards would indicate that you're going the wrong way (a common problem for many people in airports), but I've never seen it used this way; instead, it indicates either that you should descend or that you should go through the doorway below the sign. Hmm.

Consider the places where people are most likely to want to go: flight departures and arrivals. Departures is easy enough, you show a picture of an aeroplane pointing up – everyone at an airport knows what an aeroplane looks like, and they all know that they go up in the air. But arrivals is much harder. Consider the opposite; an aeroplane pointing down towards the ground. It's hardly an image which is likely to inspire confidence in the nervous flyer! We could, I suppose, have a picture of a level plane with an arrow pointing down, but remember we've already used the arrow to indicate directions; a plane with an arrow pointing down, beside an arrow pointing right, would need some verbal explanation. Some airports use a picture of people descending the staircase which is wheeled up to the plane once it's parked, but the picture itself is a bit fiddly, and the perspective is a bit peculiar. Ideally, a sign like this needs two foreground colours to make it comprehensible.

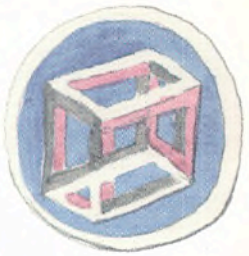


Where else will people want to go? Toilets. The male and female symbols are eminently comprehensible in the west, but the female symbol is confusing for a traveller from countries where the men wear robes, such as Africa or the middle east. Even if two sexes are identifiable, there's a problem recognising the doors as toilets when the traveller comes from a country which either habitually separates male and female social roles, or which doesn't separate toilet facilities. It gets even worse when you consider baby changing facilities. Normally we use a picture of a feeding bottle (because the only context in which a feeding bottle is used is around babies). But the image will be completely incomprehensible to people who don't use feeding bottles, and it may be deceiving to people who don't associate a bottle with changing nappies. That problem hasn't been solved adequately.

Even food represents a real problem. We use a knife and fork (in various arrangements) to indicate food, but to people who use chopsticks or fingers, knives and forks don't immediately indicate eating.

When I left the airport, and came back to my computer, I was more confused than ever. The places where one goes in an airport are simple places which everybody needs to use, and we still find cultural problems in expressing these places visually. In a program, the buttons are not places, they're verbs, and they tend to be far more complicated. Is it really true to say that pictures are simpler than words, and require no translation?

We could do a lot better than we do by making use of the culturally neutral symbols which do exist. Instead of using a question mark to represent help, we could have used the internationally recognised 'i-in-a circle'. But, far more usefully, we could use geography more carefully. I doubt that anybody has mistaken Windows 95's cross to destroy a window for a check box, because it doesn't appear where you would expect a check box to be. In the airport, for example, toilets are all collected together. There's a sign representing a tap, and an arrow pointing towards the toilets. When you get there, there are signs depicting a man, a woman, a feeding bottle (though I can't help feeling that an adult and child would be more descriptive), and a wheelchair. In the context of washing facilities, these symbols become far more comprehensible, and far less likely to lead to confusion.



Consider, then, if you will, the old faithful prototype wordprocessor. To change the style of the text, you select a block of text, and press (or release) the bold, italic, or underline buttons which you'll find on the toolbar, or else you select the equivalent commands from the menu. If you don't have a block selected, these buttons are effectively useless, but are rarely disabled. If the user selected a block of text, and then performed some action (such as right clicking), then these, and only these buttons would show up. It is then obvious what they mean, and what they apply to.

I can see the objection; unlike normal menus, which offer their facilities all the time, this approach requires that the user knows what things he can select, and it hides away much of the functionality inside a multiplicity of menus. I've thought about this, and I've done some tests, and I've decided that this doesn't matter. The goal of all programs working the same way has, I think, conclusively been shown to be unattainable, because different programs use different kinds of data. Provided the online help explains the things that can be selected, and how it's done, and provided that there aren't too many of those things, a single standardised action to bring up a collection of verbs doesn't appear to be confusing to the user. Indeed, it is possible, using special symbols to represent mouse and keyboard actions, to show all the different kinds of selections which can be done in each area on a status bar, and the bar will change as the mouse moves around the screen.

This approach sounds a lot like direct manipulation, as opposed to the menu-driven interfaces that most programs use. I've complained about menu-driven programs before, and argued for the aesthetic benefits of direct manipulation. But I find myself arriving at the same conclusion via a quite different route. I'm certain now that menus are a bad idea. ■

Jules can be contacted on 01707 662698, or on Cix as jules@cix.compulink.co.uk.

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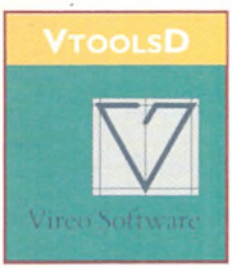

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Optima++ Developer is the first RAD tool to combine the power of an industry standard O-O language, C++, with the productivity of a component-centric client/server and Internet development environment. Includes a built-in copy of 32-bit Sybase SQL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

Btrieve 6.15

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... Promotional upgrades from previous versions available until May 31st... ***Upgrade Now***

CodeWright Professional 4.0

The programmer's favourite programmer's editor, now has a user interface polished for Windows 95. Favourite features, such as multi-file, multi-window editing, including search & replace, chroma-coding and more.. are enhanced with the new API Assistant and Button Links to tag notes etc. Available for Windows 3.1 and Windows 95 & NT in a single pack. ***Now available on CD or 3.5"***

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.

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WebObjects: the NeXT big thing in distributed computing

NeXT has released WebObjects 1.0, a cross-platform system for distributing applications across the World Wide Web. WebObjects is an extension of NeXT's pre-existing PDO object distribution and Enterprise Objects Framework (EOF) technologies, which allow users to access information held remotely on mainframes and legacy databases through a consistent business object model. WebObjects takes this technology one step further by distributing the data through an HTTP server to any Web client. Developers can create highly interactive Web interfaces; for example, a Java applet on the user's Web browser could interoperate through PDO to support special custom controls. Remote OLE (based on NeXT's D'OLE) across the Web is possible with the Pro and Enterprise editions.

Business objects are written using Objective-C, the 'alternative' object-oriented version of C which has been the foundation of NeXTStep's OO development environment, or using C++ (although NeXT believes that developers will be able to exploit the power of the system more effectively if they use Objective-C). WebObjects itself can be controlled through various scripting languages including VB Script and JavaScript, and with the Enterprise edition developers can use C++ or Objective-C to develop both WebObjects projects and EOF business objects.

The standard WebObjects package can be dowloaded free of charge from the NeXT World Wide Web site, and an example Web-distributed database can be tried out there. WebObjects Pro is priced at $2,999, while WebObjects Enterprise lists from $24,999.

NeXT UK is on 01628 535222 *URL: http://www.next.com*

Lotus targets the Web with InterNotes Web Publisher 4.0

Lotus has annouced InterNotes Web Publisher 4.0, a Web tool which uses Notes 4.0 to publish and update Web sites. InterNotes Web Publisher (IWP) is designed to take the strain out of updating sites which carry a lot of changing information such as tables and news text. The software can convert Notes documents, views, and forms into HTML pages. The Web content remains in the Notes database, where it can be navigated and searched using the standard tools built into Notes itself. By linking HTML pages to Notes databases, IWP extends the groupworking features of Notes to the Web itself, enabling companies to publish information as a part of their normal business process rather than needing a specialist Web development team, as well as inheriting the security aspects common to all Notes databases.

Platforms supported are AIX, Solaris, Windows 95/NT, and OS/2. IWP 4.0 only works with Notes 4.0 servers; for Notes 3.x servers, IWP 2.1 is available on OS/2 and Windows NT. You can download IWP 4.0 from the InterNotes Web Publisher site, free of charge.

Lotus: 01784 445211 *URL: http://www.internotes.lotus.com*

StrongARM tactics: companies announce RISC products

This months saw a flurry of announcements about Acorn offshoot, Advanced RISC Machines' ARM processor family, with a number of embedded developer-related software products being launched. JMI Software Systems announced an ARM version of C Executive, its real-time OS kernel for embedded systems. C Executive is ideal for embedded systems programmed in C, and includes an optional file system, TCP/IP stack, and SNMP support. It will support the 'Thumb', a version of the ARM chip with a set of 'compressed' 16-bit instructions for rapid execution speed, and a 16-bit bus for lower board component costs. The retail version of C Executive will cost $2,500.

Cygnus Support announced that it is to port the GNU Pro development suite to the ARM family. GNU Pro is a package of GNU's C/C++ compilers and tools together with remote source-level GUI debugger, which Cygnus has already ported to a number of common embedded environments. The GNU tools are widely regarded as producing the some of the best code of any compilers, despite being freeware in many implementations. Cygnus' GNU Pro for ARM can be hosted on Solaris or Windows NT systems. A beta release is due in July, while a Thumb-enabled version is expected in beta by November.

Enea OSE Systems announced that its OSE Basic real-time OS has been ported to ARM. OSE Basic is the second-level version of OSE, which is a four-level family targeted at increasingly sophisticated embedded applications. OSE Basic is aimed mainly at 16-bit control systems for equipment such as mobile phones and car ignition systems. The OSE Basic kit for ARM includes a debugger (which can work in concert with the built-in ICE debugger), a C compiler, and additional OSE-specific developer tools. Prices start at $10,000.

ARM: 01223 400400 *Cygnus: 00 1 415 903 1400* *Enea OSE: 00 46 8 638 5093*
JMI Software Systems: 00 1 215 628 0840

AFD Software has released a 32-bit version of its **Postcode DLL**. The DLL adds rapid addressing and postcode checking features to Access 7, Delphi 2, Visual Basic 4.0, and other popular applications, and is free to registered 16-bit users, others POA. AFD is on **01294 823221**

IMS recently launched version 7.53 of its multi-user OS, **REAL/32**. The OS can run multiple DOS and Windows sessions, and in v7.53 can supply each DOS session with its own TCP/IP connection through Novell's LAN Workplace. Price: POA. IMS: **01276 686569**

Galacticomm has released a beta v2.0 of **Worldgroup**, a Web/workgroup integration product. A supplied Netscape 2.0 plug-in allows remote use of any Worldgroup-enabled services on Web clients on either Internet or Intranet. Beta prices from $476. Galacticomm: **00 1 954 583 5990**.

Information Builders has announced **Enterprise Data Access 4**, claiming to be the first 'multi-function' middleware. Among the features is the ability to distribute corporate applications and data over the Web. Price: TBA. Information Builders is on **0181 982 4700**

Cincom has previewed **Total Framework**, a business workflow modelling and application generation tool based on business objects. According to Cincom, in the future, developers will build the objects, while managers will build custom applications from them. Price: TBA. Cincom: **01628 542300**

NEWS

- **Blue Sky** has announced RoboHelp 95 HTML Edition, an add-on to Microsoft Word 95 which generates Windows Help files and a matching set of HTML files from a single set of source code. Price: $699. Call **00 1 619 551 2485.**

- From **Client/Server Labs** comes a new benchmark, **RPM/dbs.** Capable of benchmarking very large systems, it can test for the impact of a single component such as device drivers. An annual site license costs $2,500. Contact Client/Server Labs on **00 1 770 552 3645**

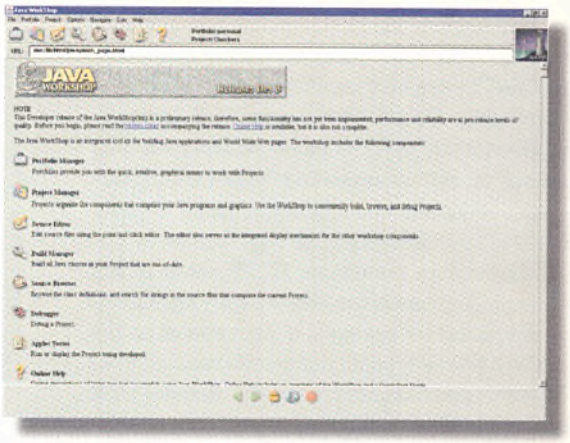
- **MKS** has announced the availability of **Integrity Engine 1.0**, a version control tool for Web sites. The software keeps track of all changes to a site, authorises changes, and frees the Web master for other tasks. Price: $995. MKS: **0171 624 0100**

- Users of **Sculptor** client-server systems can now access their data from Excel, Access and Visual Basic using a special version of **U/SQL** written by **Transoft**. U/SQL extends ODBC to non-relational data and Oracle, Informix or Sybase data. Price: POA. Transoft are on **01753 778000**

- **Object Design** has launched **ObjectStore Inspector**, a viewing/querying tool for the ObjectStore OODBMS. With Inspector, developers no longer have to write C++ code to view or edit object data. Prices start at £800 per user. Object Design (UK) are on: **01344 458200**

Sun goes into Java overdrive with Joe and WorkShop

Sun recently pulled the wraps off Java WorkShop, a Java development environment built around a Web browser. Unlike traditional IDEs, Java WorkShop functions almost entirely within the Web browser environment (in fact, Java WorkShop can be used *as* a Web browser). Information from the class browser, debugger, and other parts of the system are presented to the user in the form of Web pages with appropriate links. Applets can then be published across the Web directly from the development environment which also provides all the tools you need to build your HTML pages. At present, support for the beta version is on 32-bit Windows and Solaris. The beta can be downloaded for a 30-day trial from Sun's Web site.



Also announced was Joe, a system designed to allow Web clients to access applications and databases on corporate networks. Joe is written entirely in Java, making it a universal client for any Java-enabled platform or Web browser. Unlike competing solutions, Joe is the only tool which should, in theory at least, run on any system without alteration. Joe includes a Java Object Request Broker which is CORBA-compatible, and will communicate with any Internet Inter-ORB Protocol (IIOP) 2.0-compliant ORB. A beta version of Joe will be available for download on Sun's Web site from early June.

Sun is on 01494 472900 *URL: http://www.sun.com*

Vendors queue up to join Web computing bandwagon

Several systems (including NeXT's new WebObjects technology covered on p.9) have recently arrived which access and manage databases and other types of application over the Web, using HTML as a front end.

Sapphire/Web from Orbis Technology is a Unix client/server database management tool which provides access to Oracle, Sybase and Informix databases as well as legacy systems. Sapphire/Web developers can graphically assign HTML form elements to corresponding database or application interface elements. Communication between the application running on the server and the Web gateway is handled by CGI code which Sapphire/Web generates automatically based on the developer's original graphical specification. Available for Solaris, SGI, HP-UX, Digital Unix and AIX.

FTP Software has Esplanade WebServer for Windows NT, which delivers database connectivity through the Web, but also enables what FTP terms 'dynamic document conversion'. Documents of whatever type can be distributed from point to point via the Web, edited in place by the recipient, and then re-submitted, without the need for specialist client software.

Amazon from Intelligent Environments covers the same ground but is designed to interface with the company's AM client/server development tool. Amazon supports a variety of database standards including DB2, Oracle, Sybase, SQL/Server and ODBC. Available for Windows NT and OS/2 Warp.

Pricing for all three products is available from the companies themselves.

Orbis is on 07000 866100 *FTP on 00 49 89 61 4130* *Intelligent Environments on 01932 772266*

Apple RAVEs on with QuickDraw3D extension

Hot on the heels of Microsoft's Direct3D beta test announcement last month, Apple has gone one better by announcing the availability of the Rendering Acceleration Virtual Engine (RAVE) API developed from its QuickDraw 3D technology. Technically, RAVE isn't new: the code itself was present in QuickDraw 3D internally. What Apple's engineers have done is to expose the innards of RAVE to the outside world as an API, which provides support for 3D graphics in code through a standard, cross-platform, hardware- transparent API. By using RAVE, developers achieve the same 3D performance as QuickDraw 3D itself. Adapting existing code to work with RAVE will be less time-consuming than re-writing it to work with QuickDraw 3D at the top level.

RAVE is essentially a Hardware Abstraction Layer (HAL) designed to make access to 3D acceleration hardware transparent to the user and the developer. RAVE ensures that whatever acceleration hardware is present on a target system is used, but if necessary can render in software alone. Apple claims that in these cases the rendering and texture-mapping code in RAVE will provide 'exceptional' speed even without acceleration hardware.

QuickDraw 3D RAVE is available for MacOS, Windows 95, and NT. For pricing or availability information, developers should contact Apple directly.

Apple is on 0800 127753 for more information

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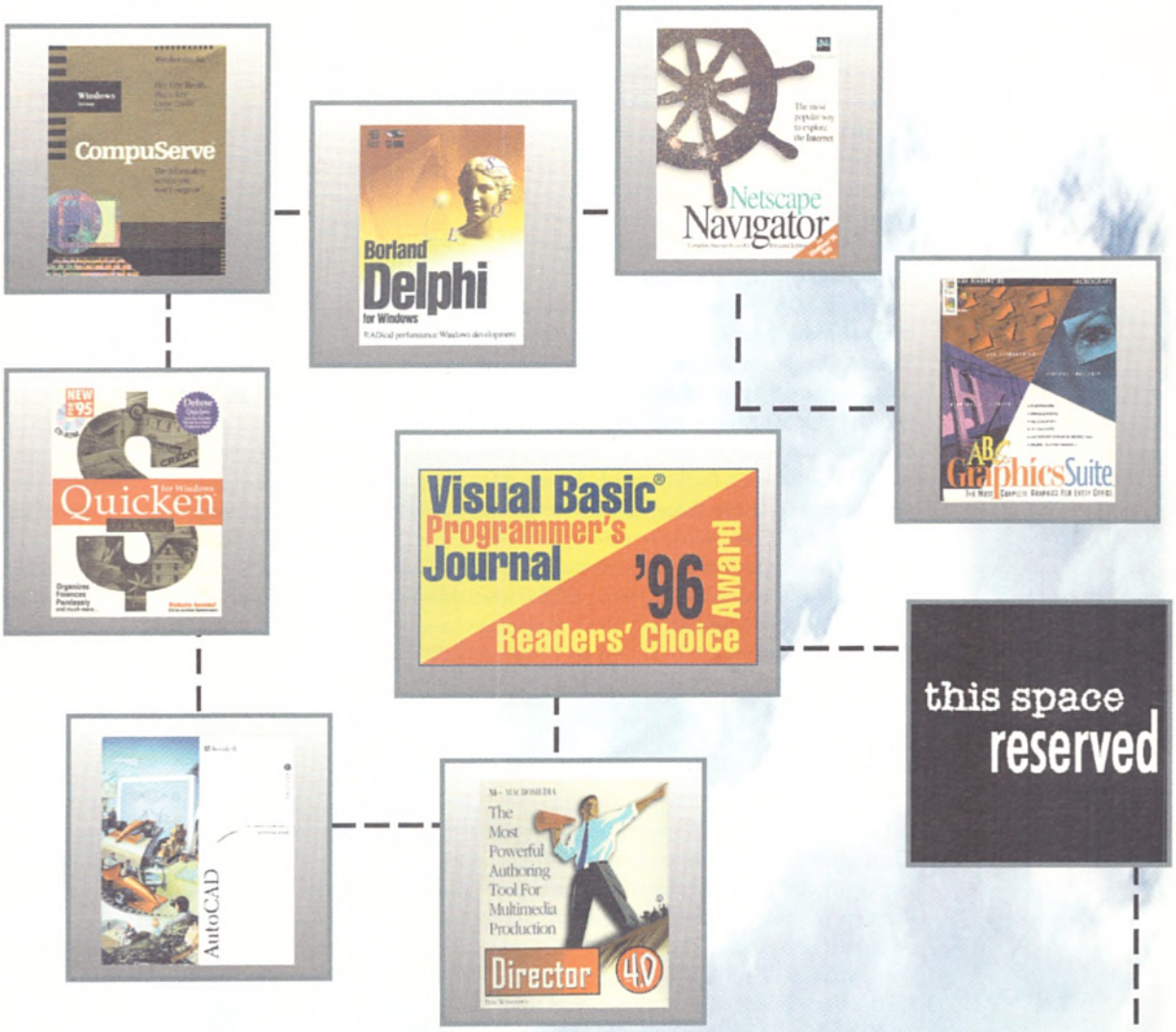

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Compuserve: 100326,3271
email: sales@syssci.co.uk

Systemstar SoftTools Ltd.
Phone: (01707) 278300
Fax: (01707) 268471
Compuserve: 100637,3301

Gimpel Software has released version 7 of **FlexeLint**, a C/C++ code checking tool, which features inter-statement value tracking, with the information being retained across statement boundaries. Priced at $998, FlexeLint will also check user macros. Contact Gimpel on: **00 1 610 584 4261**

Integrated Systems has announced extensions to the pSOSystem embedded OS to support Java applets. Its **SNiFF+** embedded development kit will provide new tools for compiling and debugging embedded Java applets for pSOSystem. Price: TBA. Call **01438 751651**

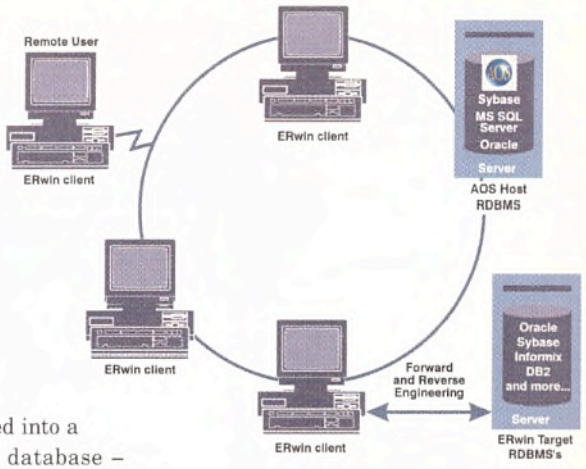
Chorus Systems has released an evaluation version of its **Chorus/Cool** ORB. Chorus/Cool brings CORBA compliance to Chorus' componentised operating systems. Download it from **http://www.chorus.com**. Chorus is on **00 33 1 30 64 82 16**

AIG Computer Services has released **Solus/DDM 2.0**, an upgrade to its client/server access tool for PCs to access AS400 databases. AIG claims that the new Solus outperforms SQL or ODBC by 'more than 1000%'. Cost per CPU is $6995. AIG: **01932 567769**

From **Business Objects** comes **BusinessObjects 4.0**, an OLAP query, reporting and processing tool for database developers. It features a fully 32-bit architecture, a dynamic microcube engine which generates SQL queries automatically, and an easy-to-use graphical interface featuring wizards. Price: POA. Business Objects: **01628 487722**

AOS brings workgroup support to model management

Logic Works recently unveiled AOS, an extension to its ERwin database modelling product. ERwin can generate an entire database's code solely from a graphical model of the database structure, and conversely can reverse engineer existing database code into a graphical model. It supports what Logic Works claims are the 20 most commonly used database formats. AOS provides workgroup facilities to ERwin, enabling teams to work on the same object models one at a time or in groups.



Under AOS, the data models are moved into a central store hosted on the enterprise database – Sybase, Oracle and Microsoft SQL Server are the supported hosts – where they can be accessed by any ERwin client on the network. Models in the AOS central store (which Logic Works terms the 'ModelMart') can subsequently be re-used and extended. The AOS client code adds functions to ERwin to allocate permissions to users, check revisions, and features intelligent conflict resolution, a facility which detects where two users have made conflicting changes to the model and tries to reconcile them, calling for an operator decision where necessary. AOS keeps a log of all changes, and allows multiple revisions of a model to be kept side-by-side for later review.

Logic Works is also working on making AOS interface with BPwin and OOwin, its business process and object-oriented modelling tools. AOS is available now along with ERwin/ERX for AOS at list prices of $24,500 and $3995 respectively. No UK pricing was available at the time of writing.

Logic Works is on 00 41 41 768 00 10 *Fax 00 41 41 768 00 20*

Microsoft and Synon to produce Obsydian for BackOffice

Microsoft and Synon have announced plans to work together on the new version of Synon's Obsydian client/server development tool. Obsydian is a model-based development environment in which client/server applications are generated from an extensive library of business objects. Microsoft and Synon plan to extend this environment to encompass BackOffice, Microsoft's integrated package of server software for Windows NT, incorporating NT Server, SQL Server, Systems Management Server, SNA Server, and Mail Server. Obsydian will be the first tool to be able to automatically generate BackOffice-compliant applications with full OLE container and drag-drop support, SQL Server support, and ready off-the-shelf for the BackOffice certification program (compliance with certification requirements is guaranteed).

As well as the BackOffice extension work, Microsoft and Synon have agreed to co-operate to add Visual Basic and OLE support into the Obsydian development environment itself. As yet, no timescale has been indicated for delivery of the new product.

Synon Europe: 0181 748 7848 *Microsoft: 01734 270001*

Visual C++ 4.1 will get 3D extensions to MFC

Microsoft is to bundle two new 3D graphics development tools with the shipping version of Visual C++ 4.1. Both tools come from French/American company G5G-TGS (Graphisme 5ème Génération-Template Graphics Software). In keeping with Microsoft's new strategy of including Internet support in all software, Visual C++ 4.1 will be enhanced with a number of new Internet components. G5G-TGS will supply Visual 3Space Browser, a VRML ActiveX control which adds VRML browsing features to any application, and Interactive Visual Framework (IVF), a set of 3D extensions to MFC for 32-bit Windows only. Access to the new functions will be through the IVF Custom AppWizard, which will include a number of pre-defined classes for common 3D modes such as 'walk' (2D movement), 'fly' (3D movement), and 'plane'. IVF is derived from OpenInventor, a Silicon Graphics 3D C++ class library licensed to G5G-TGS, and in this release supports the VRML 1.0 subset of that library; VRML developers should be able to use it with no need for re-training.

G5G-TGS will supply another Silicon Graphics-sourced tool, SceneViewer, a 3D viewing program based on OpenInventor. With SceneViewer, VC++ 4.1 developers will be able to preview 3D graphics developed in VRML, Autodesk 3D Studio, PTC Pro/Engineer and Caligari Fountain formats, and well as browse 3D resources on the Internet.

G5G-TGS is on 00 33 1 42 37 66 66 *Fax: 00 33 1 42 37 27 15*
URL: http://ftp.univ-lille1.fr/g5g

- **NuMega Technologies** has updated **BoundsChecker** to include error detection support for the ActiveX technolgies from Microsoft. This makes BoundsChecker, priced £299 for the standard edition, the first product to provide support for the new technology. NuMega: **00 1 603 89 2386**

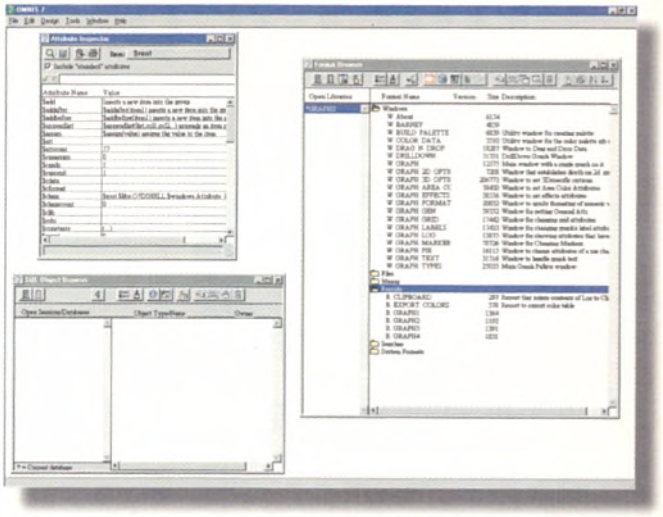
- **Sybase** has released **Sybase IQ**, its new data warehouse server. IQ features a wide range of SQL and OLAP processing tools together with advanced data compression to reduce storage overheads. IQ requires minimal database tuning to be used effectively. Sybase is on **01628 597100**

- **LBMS** announces **Insight 1.0**, an object management tool designed to facilitate reuse in client/server environments. Price: £165. Call LBMS on: **0171 878 8762**

- **Rational Software Corporation** has announced **Apex C/C++ Cross**, a cross-platform development environment for PowerPC processors. Apex is hosted on Sparc platforms under Solaris. Support for other processors and controllers is planned. Rational Software: **01273 624814**

- Version 1.2 of the business process modelling tool **First Step**, from **Interfacing Technologies**, has begun shipping. First Step features a much-enhanced event simulation engine which is claimed to run up to 20 times faster than v1.0. UK pricing is £5500 per user. Call **01280 821400**

Omnis Client/Server tools for Windows 95



Blyth Software has ported its Omnis client/server systems to Windows 95/NT. The new 32-bit products complement the existing 16-bit Windows versions. Omnis is now available on all current Intel-based Windows platforms, and for both Motorola and PowerPC versions of MacOS. According to Blyth, Omnis will permit significant code re-use between platform implementations, while backward compatibility with over 60 legacy databases will allow businesses to carry forward previously developed databases into new Omnis-developed systems.

The developer tools supplied include an SQL Form Builder, Format Builder for easy GUI creation, Object Browser (plus SQL version), Attribute Inspector, and Interactive Debugger. Omnis also contains its own SQL RDBMS engine for use on local and mobile machines. The revised GUI development system is more Visual Basic-like than before and provides a range of objects designed to speed up development. Emphasis has been placed on the ability to develop on one platform but deploy on many different ones. Contact Blyth for pricing details.

Blyth Software (01344) 482258 *URL http://www.blyth.com*

Novell get set for Net2000

Novell has announced the initial steps in its distributed computing developer initiative, Net2000. First off is support for Basic scripting languages which will be built into NetWare. Novell promises that developers will be able to use a wide variety of Basic scripting languages including Visual Basic and NetBasic to create NetWare Loadable Modules (NLMs) as well as NetWare applications. NetWare Directory Services (NDS) will be controllable from the scripting language.

As part of the Net2000 program, Novell has licensed the Network Management Extension (NMX) from HiTecSoft; with NMX, Basic scripts can carry out automated tasks across local and wide-area networks (including the Internet) on behalf of administrators, such as peforming regular backups, unloading NLMs when not needed, and performing housekeeping duties. With NetWare Web Server, it is even possible to remotely administer NetWare servers over the Web.

Novell also announced that, as part of Net2000, it has licensed Sun's Java technology, and intends to build support for the Java Virtual Machine (JVM) directly into NetWare. Java applets will be able to reside and run on NetWare servers, and be distributed across the local network or out onto the Internet.

A CD-ROM with sample scripts and Net2000 components is available to Novell DeveloperNet subscribers free of charge.

Novell is on 01344 724000 *URL: http://developer.novell.com/net2000*

Interated Systems promotes Internet

Iterated Systems has released a series of SDKs for its Fractal imaging technology, which allows developers to incorporate support for the Fractal Image Format (FIF) in their applications. Iterated believes that FIF is the best format for transmitting files over the Internet, and is trying to encourage developers to obtain the FIF encoding and decoding SDKs.

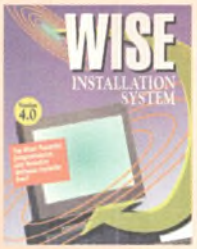
Unlike traditional bitmap formats, FIF stores pictures as a series of mathematical expressions, or *fractal transforms*. The compression/imaging software identifies the patterns in the source image and records them. The resulting file can be as much as 100 times smaller than the original – on a par with MPEG video compression. When the patterns are run through the decompression engine, the original image is reproduced, and each time the patterns are run through the image quality improves. Because of this, fractal images can be displayed at lower *and* higher resolutions and/or colour depths than the original image with no loss of quality. Iterated thinks this is just the sort of image format the Internet needs.

SDKs are available separately for compression and decompression of fractal files. There is no license fee for programs which incorporate the decompression algorithms, but software which uses the compression routines is subject to an annual fee. Toolkits are available for Windows 3.x (with Win32s), Windows 95, NT, and Macintosh, and can be downloaded free of charge from Iterated's Web site.

Contact Iterated systems on 01734 880261 *URL: http://www.iterated.com*

Wise Installation System Version 4.0

The **Wise Installation System** creates professional installation programs for Windows, Windows95 and Windows NT as a single EXE file. You may upload this single file directly to a BBS or on-line service or send it via e-mail; no separate de-archiver is necessary. It supports display of graphics during the installation, version checking, executing external programs, editing INI files, editing the registration database, multiple installation directories, adding icons to the Program Manager, If/Else branching, installation logs, scanning for referenced DLL/VBXs, network/CD-ROM installations, and adding files via drag and drop. Wise is completely Windows based, including the script editor and the file compressor. You do NOT have to edit text based script files.



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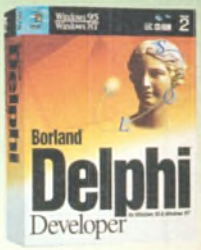

Borland's peerless RAD tool receives its first upgrade.

Delphi Developer 2 is the fastest way to prototype, build and deploy greased-lightning, royalty-free Windows 95 and Windows NT applications. The only object-oriented development tool that gives you the benefits of a component-based visual programming environment, the performance of an optimising 32-bit native code compiler, and scalable database programming tools.

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delphi 2 pricing	
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developer	£399
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FUNCky Version 2.5

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VisualLED - digital display control.
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Consciousness of a dog

Dear Sir,

I am enjoying reading the discussion about the nature of consciousness on your letters pages but feel that I can add something to the debate. First and foremost, the discussion on deterministic and random actions serves only to befuddle the underlying issue. What Penrose attempts to show in *Shadows of the Mind* is that a strictly non-random non-computable action must be present in the brain, and thus since it is non-computable, it cannot be replicated by a computer. As far as I can tell, Penrose does not say whether he thinks the action is deterministic or not, but his argument makes it clear that this is irrelevant, since what matters is the action is non-random and non-computable.

Similarly, the relevance of quantum mechanics is of secondary importance. The argument in *Shadows of the Mind* is clearly divided into two parts. The first half of the book is a thorough examination of the reasons why a non-random non-computable action for the brain is required, based, as Marvey Mills says, on Gödel's incompleteness theorem. It is *this* argument which must be refuted by those who believe that a correctly programmed computer can do everything that a human can. Quantum theory has nothing to do with it.

The second half of the book deals with a search for where such non-computability may be found, and where Penrose suggests that a 'completion' of quantum theory may provide the answer. I suspect that even Penrose is not convinced that it will do, but whether or not it does, it has no bearing on the fundamental question. This is because if non-computability is required and quantum theory is not the solution then it must lie elsewhere in the physics of the brain.

On the rest of the debate, I have several thoughts. Jules May doesn't seem to have grasped the way science works. Of course the advocates of a new theory must declare it to be the truth and all conflicting theories wrong, it is part of the process whereby the theory lays itself open to be challenged by its opponents and finally either affirmed or (more usually) refuted.

I don't get David Bailey's paradoxes. All computers are Universal Turing Machines so the platform the software is running on is irrelevant, providing that appropriate inputs from (and outputs to) the external environment are provided. Pain, it seems to me, is more a response to environmental input than a software function. Providing we can detect that the computer's other conscious actions are detrimentally affected by this input, and that the computer is in some way 'aware' of being affected, then we can assume that something akin to pain is taking place. I suspect that we cannot treat pain as a self contained entity but only as a part of consciousness. This makes it nonsense to talk about a single line of code as the one that generates pain.

I am puzzled by the discussion over whether the computer's consciousness would be the same as a human's. If we can build a conscious computer, then it should make little difference whether we give it the consciousness of a dog, a human, or a consciousness unique to computers. I can't see why we shouldn't build one with a crotch, susceptibility to heat and indeed instruct it to tip hot coffee into its crotch at regular intervals!

Finally, Jules May seems to be of the opinion that all this doesn't actually matter since nothing can yet be proved one way or the other. Personally, I don't think the world is yet rich enough to be able to spend time and money trying every possible idea in case it works. It may be that we already have a mathematical proof that attempting to build a conscious computer is impossible, at least in terms of computers as we know them today. In this case, we should be concentrating our future efforts on more fruitful lines of research.

Nicholas Stimpson
Email address supplied

The point about deterministic and random processes is precisely this; that these are the only kinds of process is in the universe. There are quite a lot of non-computable functions, it's true, but there are no non-computable processes.

Suppose there were such a thing as a non-computable process. We need only harness the process itself, and bingo – we have a result. If the process is predictable, we can store the results of these measurements in tables, and interrogate the tables. If the process is not predictable, we can separate out the unpredictable part of it and leave the predictable part behind.

What if the process is intrinsically chaotic? In that case, we can't use our computer model to make predictions about the future state of a real system, but we can simulate a hypothetical system and deliver as much accuracy as we want. In developing a conscious machine, that's all we have to achieve. It seems reasonable to assume this is

true for a biological clone as much as for a digital one.

Gödel's theorem talks about pure deductive reason. A model based on pure deductive reason which makes either inaccurate predictions about the universe, or no prediction at all, is a wrong model. For non-computable processes to exist, there must be processes which have no model. If no model can ever be constructed for them, then they are indistinguishable from random events, and a random process will model them perfectly accurately.

I think Mr Stimpson doesn't understand the way science works. Of course, people need to believe in their hypotheses, but the principle is always to see how closely a hypothesis can predict the behaviour of the universe. A hypothesis is not a theory, and a theory is not a truth. Scientists know that perfectly well, but their publishers, their PR people, and the lay public often don't. A hypothesis must, necessarily, be predictive in order to garner evidence for its truth – a point on which Penrose falls down seriously.

It may be that, one day, we will have a proof that conscious computers are impossible, but I'm convinced we don't have one now. The world is not so rich that it can invest in every hairbrained idea, but the cost of machinery is such that the inventors of most ideas can pursue them privately – after silicon, brainpower is probably the most plentiful resource on the planet. However, the world is not so poor, nor so impressionable, that it has to give up what remain very promising avenues of research on the say-so of one man, and the world is sufficiently large and diverse that it can't afford to put all its eggs in one basket, no matter who the owner of the basket happens to be.

Nobody can throw maths at consciousness, because we don't know what it is, or what it's for, or where it came from, or where it goes. We know almost nothing about it. There are two ways to fix that; we either find existing consciousness, and take it apart to find its components (something which is being done perfectly adequately by perception games and drug experiments, and less satisfactorily by accidents and illness), or we try to simulate bits of consciousness using the only idea amplifiers we have (which has been less than successful for a number of interesting reasons, but very fruitful nevertheless). Penrose, were he to be believed, would close both these doors. And I don't believe him.

Email failures

Dear Sir,

People trying to make initial contact with the Association of C & C++ Users via our published Internet address of *info@accu.org* have been having their email bounced. This has nothing to do with the health of ACCU. Demon Internet Services are contracted to redirect mail to accu.org. At least twice during the last six weeks they have lost the vital MX record that provides such redirection. Obviously we have no way of contacting those who had email bounced. If any of your readers wish to obtain information about ACCU and have had email to *info@accu.org* bounced, they can send email to me at my private address of *francis@robinton.demon.co.uk*. Anyone else interested in C, C++, Java and related programming languages can get more information either by email or by writing to me at 64 Southfield Road, Oxford, OX4 1PA.

Francis Glassborow
Chair of ACCU

Who'd write a script in Microsoft Word?

A number of acquaintances are tracing their family roots and using a variety of PC-hosted tools to store their findings. One thing that all these tools have in common is a genealogy database format known as Gedcom; another is that they produce very poor reports! When someone asked me to convert a Gedcom file into a nicely formatted Word for Windows document I wondered which language I should use: Perl, Basic, C, AccessBasic, WordBasic... Many small applications, ideal for scripting, start off with a specification vague and open-ended like this one – the initial step is to define the problem more precisely.

Requirements specification

First, what is Gedcom? Briefly: it is a fairly simple ASCII text line-based database. It is easy to parse, but not particularly easy to process directly, and was intended mainly to share information between genealogists. See the box *The Gedcom format* for more details. Incidentally, the *http://genealogy.emcee.com* site mentioned in the box contains a number of Gedcom utilities, including some C libraries, and a tool which converts Gedcom to Microsoft Access database format – this latter tool would have been useful except that the task of producing reports would have been much less interesting and, more importantly, I don't have access to Access!

What about the output: because I wanted a nicely formatted Word document (or at least, something that Word would import), I reckoned that I would have to produce rich text format (RTF) – RTF is relatively complex, but I would only need a few small parts of it. As far as content is concerned, my first thoughts were to have a few paragraphs per person, formatted so that the start of each Gedcom record would be easily identified. Thus there are two parts to the translation process – styles (all individual records will start off with the person's name in Word's `Heading 1` style); and textual transformations, such as the `@I...@` identifiers being replaced with names and all the family records replicated in-line so that someone's husband could be found directly instead of via another record. At this point I thought about Word's 'GoToButtons' – if I could replace Gedcom references with these, then links to other individuals could be followed by double-clicking a name. This was only a secondary objective, and I could live without it if it proved to be difficult to achieve.

One other requirement was that the transformation need only be one way – I do not have to retain enough information in the destination file to be able to regenerate the Gedcom source; the source file contains no more than about 200 people, but some entries had long notes attached meaning that the whole file could easily be more than 64 KB. Finally, the program would not be run very often, and would not need to be particularly quick.

That's more or less the total problem definition, still quite vague compared with a 'real' program. I would obviously have to build a few prototypes just to get a feel for the approach, and that was a major factor in choosing a language in which to implement the tool – something I could change and retest quickly.

Pseudo-code for a typical pass

```
search for XXX
while found
   perform some local text manipulation
   search for next XXX
end loop
```

Pass control code in WordBasic

```
StartOfDocument
EditFind .Find = "XXX", .WholeWord = 1, .MatchCase = 1
While EditFindFound()
   perform some local text manipulation
   EditFind .Find = "XXX", .WholeWord = 1, .MatchCase = 1
Wend
```

Listing 1: Pseudo-code and WordBasic code for a typical pass

Design

It seemed simpler to process the file in a number of passes, gradually moulding the Gedcom text into a prettified document. The most difficult job is that of translating text, the format changes are quite easy and can be slipped into the translation phases with little effort. I will therefore concentrate on the content transformations. The passes I identified were:

1) Simple transforms – for example, DATE and PLAC records tacked onto the end of the preceding lines, or all notes lines amalgamated into one paragraph.

2) More complex single line formatting – for example, format all BIRT records as style Birth.

Keep an open mind about languages – there are many scripting tools around, with different strengths – a good choice can make programming very easy. **Gavin Smyth** gives some hints on how to pick the best one for your needs.

3) Gather all individual cross-references – find all INDI records, format them (removing the slashes around the surname) and store the mapping from @I...@ to name for future substitution.

4) Replace all @I...@ with the corresponding name (maybe as a Word GoToButton).

5) Gather all the family cross-references – find all FAM records and store a mapping from @F...@ to family members.

6) Replace all child-parent relationships (FAMC references) with references to the parents, and maybe siblings too, and replace all spouse relationships (FAMS references) with the other member of the relationship.

7) Any other tidying up required – deleting any extraneous characters left over by earlier phases, such as multiple spaces.

So now, what language should I use for the job? Some of the more important questions to ask in a case like this are:

- What languages do you have access to?
- Which one are you familiar with (or want to learn)?
- Since each language has its strengths and weaknesses, how do they map onto the task in hand?

In Figure 1, I present the strengths and weaknesses for a number of languages – the numbers run from 1 to 3, with higher numbers meaning better. This is of course fairly subjective, especially the final column in which I state how important each facet is. Some of the row titles deserve a little explanation: *memory constraints* refers to the language's (or strictly speaking, the implementation of the language to which I have access) ability to cope with large data structures; *output format* is high for WordBasic's ability to 'write' documents directly and lower for writing RTF. This sort of table can be used in any complex decision making process (though there is a tendency to fiddle the numbers to match preconceptions!), with the overall winner being the column with the highest weighted sum.

The Gedcom translation problem is mainly text manipulation – matching strings, moving to either end of lines, extracting substrings and copying them elsewhere. That more or less ruled out C as much too laborious (though I could have investigated the library mentioned earlier, or used C++ classes to hide all the low level string functions). I was familiar with a number of scripting languages on Unix environments, however, not all of these have been ported very well to MS-DOS. Really, the only one of them worth serious consideration is Perl: it is designed for processing textual data, but with bits of just about every other language under the sun thrown in! It is a very big language – the Perl motto is 'There's more than one way to do it' (from the Perl man pages, but I think the 'one' in that ought to be replaced with 'four'!) – though you can quite happily use a subset and ignore the rest until you really need it. Perl code looks somewhat like awk or sh, or maybe even a little bit like C. A couple of MS-DOS ports of version 4 can be found in the */packages/ibmpc/simtel/msdos/perl* directory on Simtel (mirrored in the UK at *ftp://sunsite.doc.ic.ac.uk*) and a version 5 for MS-DOS is at *ftp://ftp.einet.net/pub/perl5*. Other possibilities include QBasic or even Visual Basic, though there is little 'visual' in this particular project.

```
Dim Shared NumIndividuals
Dim Shared Name$(1)
Dim Shared Iref$(1)

Sub MAIN
  ScreenUpdating 0
  CountIndividuals
  Redim Name$(NumIndividuals - 1)
  Redim Iref$(NumIndividuals - 1)
  CreateIndividualReferences
  CrossReferenceIndividuals

  Print
  ScreenUpdating 1
End Sub

Sub CountIndividuals
  StartOfDocument
  NumIndividuals = 0
  EditFind .Find = "INDI", .WholeWord = 1, .MatchCase = 1
  While EditFindFound()
    NumIndividuals = NumIndividuals + 1
    Print "Counting records"; NumIndividuals
    EditFind .Find = "INDI", .WholeWord = 1, .MatchCase = 1
  Wend
End Sub

Sub CreateIndividualReferences
  Dim I
  Dim TempName$
  Dim TempSurnamePos
  StartOfDocument
  For I = 0 To NumIndividuals - 1
    Print "Creating bookmarks for"; I
    EditFind .Find = "INDI", .WholeWord = 1, .MatchCase = 1
    If Not EditFindFound() Then
                  MsgBox "Error - ran out of individuals!"
    StartOfLine
    DeleteWord
    CharRight
    SelectCurWord
    Iref$(I) = Selection$()
    StartOfLine
    EndOfLine 1
    EditClear
    DeleteWord
    DeleteWord
    EditBookmark .Name = Iref$(I), .Add
    EndOfLine
    StartOfLine 1
    Style "Heading 1"
    TempName$ = Selection$()
    Rem Throw away /s around surname if there are any
    TempSurnamePos = InStr(TempName$, "/")
    If TempSurnamePos Then
      Name$(I) = RTrim$(Mid$(TempName$, TempSurnamePos + 1,
                  Len(TempName$) - 1 - TempSurnamePos)
                  + ", "
                  + Left$(TempName$, TempSurnamePos - 1))
    Else
      Name$(I) = TempName$
    End If
    EndOfLine
  Next I
End Sub

Sub CrossReferenceIndividuals
  Dim I
  For I = 0 To NumIndividuals - 1
    Print "Adding hypertext buttons for "; I
    StartOfDocument
    EditFind .Find = Iref$(I), .WholeWord = 1, .MatchCase = 1
    While EditFindFound()
      CharColor 2
      InsertField .Field="GOTOBUTTON " + Iref$(I) +" " + Name$(I)
      EditFind .Find = Iref$(I), .WholeWord = 1, .MatchCase = 1
    Wend
  Next I
End Sub
```

Listing 2: Name conversion code

```
Sub PresentDialogueBox
    Begin Dialog UserDialog 299, 316, "Select Person"
        ListBox 10, 6, 278, 273, Name$(), .Person
        OKButton 37, 289, 88, 21
        CancelButton 163, 289, 88, 21
    End Dialog
    Dim Dlg As UserDialog
    Result = Dialog(Dlg)
    Print "Result was "; Result; " and the bookmark is ";
IRef$(Dlg.Person)
End Sub
```

Listing 3: WordBasic dialogue box code

The final choice

The multi-pass approach described earlier implies that I will have to scan the whole file a number of times. It would be nice to store it in core memory for efficiency otherwise it will be very slow to read the file from disc each time. Perl places no arbitrary limits on internal data sizes, and the Perl implementation I use supports a form of virtual memory, so the only limit is free disc space, but both QBasic and Visual Basic suffer from the DOS 64 KB segment limitations, and therefore are restricted in the size of internally stored data. Round about here in my deliberations, something struck me: Word contains a macro language – WordBasic. This is not quite as slick as Perl and definitely not as portable or efficient, but it has two major advantages: first, I have access to the whole file as I edit it without really caring where Word actually puts the data; and second, I don't have to worry about RTF since I can use Word formatting commands more or less directly. A third point is that I can use all the 'clever bits' such as bookmarks and GoToButtons with ease. So, although I was not very familiar with WordBasic, and it is slow compared to Perl, I decided to use it, for better or for worse (I used Word for Windows 6.0).

WordBasic is well documented in the *Microsoft Word Developer's Kit* (Microsoft Press, 1993) ISBN 1-55615-630-8. If you have a fair amount of experience with Basic, you ought to be able to glean sufficient information from the Word help file, or by recording and viewing a few macros, before writing WordBasic code from scratch.

An accepted software development lifecycle is the waterfall model, with analysis leading to specification, to design, implementation and test. This is generally inappropriate for scripting applications, where the implementation tends to be much more experimental and iterative. However, it is very easy to fall into the trap of skipping design for short scripts – I think this is because people's first encounter with writing scripts is with very simple problems, lulling them into a false sense of their programming skills. This is exacerbated by the ease with which changes can be made, letting a clean program evolve into a tangled mess. I believe that it is at least worth spending a little time looking at program and data structure, unless the task is small, you are very familiar with the language (so that you aren't spending all your time thinking about coding details), and your job doesn't depend on the results!

In this case, the input and output form most of the specification, and the multi-pass program structure outlined above lends itself to

```
sub CountIndividuals
{
    $numIndividuals = grep / INDI$/, @ged
}

$numLines = 0;
while( $ged[ $numLines++ ] = <> ) {}

CountIndividuals();
```

Listing 4: Perl implementation of CountIndividuals

implementation as a number of subroutines, one or two per pass, and a few data structures to share information between passes – specifically, a list of individuals (a name mapped onto the location of the corresponding record in the file) and a list of families (mapping the family reference to all the people involved in the relationship). The earlier passes populate these arrays, and subsequent passes all have the body shown in Listing 1. For example, for pass 1 above, the *XXX* might be `DATE`, and the processing to be performed is: go to the start of the line, delete two words to the right (ie, the number and the word `DATE`), delete one character to the left (the newline) and insert a space.

WordBasic data structures are quite limited, so I was forced to use pairs of arrays for the mapping: one for the key and one for the value – for the individual mapping, I had `Name$(x)` containing the name for individual `x` and `Iref$(x)` containing the `@I...@` string.

Writing the program

A WordBasic 'program' tends to be a mixture of style definitions and WordBasic macros. I use styles for two reasons: first, I can easily change them later and affect all the relevant paragraphs immediately; and second, the WordBasic code can be shorter since it uses the style instead of a number of direct text formatting commands. WordBasic macros can only be added to templates, so the first step is to create a template (achieved via File/New and clicking Template) and then a macro, via Tools/Macro/Create. You can actually create a macro without first opening a template, but then the new macro is placed in the global default template: I prefer to keep this sort of work separate from 'normal' Word use, and it is convenient to have all of the Gedcom conversion code in the same place as the related style definitions.

The macro edit window opens with an empty `MAIN` subroutine. I filled this in with calls to routines for each pass, and then started on the routines themselves. The whole code is too large to present in this article, so I will just cover the replacement of individual references with Word GoToButtons in detail. Listing 2 contains the complete code for this task. A few points to note are:

- If you do not disable screen updating, the program runs very slowly, since Word moves the cursor, highlights text, etc. in response to the editing commands. This is initially entertaining, but not very useful (not even for debugging, because it happens too fast to catch the details). I turn updating off at the start of the program (`ScreenUpdating 0`) and re-enable it at the end (`ScreenUpdating 1`). On the other hand, the program can take some time to run with large files, and it is nice to give the user some feedback: the WordBasic print command places text on the Word status bar – I tend to liberally scatter calls to print throughout the program, with a final empty one to clear the status bar again.
- When the program starts, I don't know how many individuals there are in the Gedcom file, so I can't determine how big to make the arrays initially. However, WordBasic requires that arrays to be accessed in several sub-routines are declared outside any routine, typically at the start of the code. Fortunately, WordBasic does allow the redeclaration of arrays. I inserted a couple of extra passes, just prior to 3) and 5) in the earlier list, to count the number of individual and family records, and then adjust the size of their arrays.
- WordBasic can access just about all of the Word menu commands and has a rather idiosyncratic, but consistent, syntax for using commands with associated dialogue boxes. The WordBasic com-

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mand, such as `EditBookmark` (corresponding to the menu item Edit/Bookmark), takes a number of arguments of the form *.Param* or *.Param = value* for the controls which would appear on the dialogue box if the command were activated via the menu, for example `.Name = "bookmarkName"`.

- Word GoToButtons are very easily inserted for each reference to an individual: I already had to replace each `@I...@` string with the person's name and it was no difficult matter to insert a GoToButton instead, having already associated each person heading line with a bookmark.

There are a lot of other things that I could write to extend this program: as another example where scripting in Word's own macro language helps, I want to have a dialog box to let the user select a person by name and immediately go to that record – Listing 3 shows the dialog definition and a fragment of code to present it and print out the name of the associated bookmark. Note how the list box control on the dialog is easily populated with the names array defined earlier. The value of the `Dlg.Person` used after the dialog has been displayed is the number of the item in the list; in other words, the index of the name in the `Name$` array. I've also toyed with the idea of a dialog to add or edit records in a structured fashion, or even generate Gedcom from the Word document. However, either of these would move the application into the area where there are already lots of good tools, such as the databases that my tame genealogists are using, and I don't want to re-invent too many wheels...

With the job done, was WordBasic the correct language? My second choice was Perl, and I suspect the program would have been shorter since Perl is much richer than WordBasic – for example, the `CountIndividuals` routine in Perl is shown in Listing 4, along with the fragment of code to read in the `@ged` array of lines. The replacement of `@I...@` with other text could have been coded much more efficiently using Perl associative arrays, but, as I mentioned earlier, efficiency was not a major concern. However, it would have been a tedious chore to write RTF, so I think WordBasic was the correct choice here. Even if I had chosen to write the conversion utility in Perl, I would probably have had my arm twisted to write some document automation (such as using GoToButtons or the dialog box described above) after my users saw that it was possible.

Scripting advantages

Certain classes of application are often better tackled using an interpreted scripting language than a conventional programming language (however, it is also true that the location of the boundary is somewhat subjective). The main characteristics of these applications are that they involve a significant amount of string manipulation, they don't have to be particularly efficient (development time is much more important than run time), and the task is only loosely specified and may change rapidly and significantly. The advantages of scripting such an application are that decent scripting languages tend to have higher level primitives and are therefore easier to change than languages such as C. This can of course lead to hacking, so you do need to be disciplined in your use of scripting languages.

There are a lot of scripting tools around, with different strengths – you could waste time looking at all of them to select precisely the best, or pick a few general purpose ones, and become very fluent with them. My choice for most tasks is Perl, particularly because of its portability, but it is worth looking at the problem in some detail before accepting your usual choice. Additionally, as I have shown, sometimes the language selected affects the specification – the choice of WordBasic meant that the output was a Word document rather than an RTF file, leading to a development time saving by my not having to learn about RTF. ■

	WordBasic	Perl	Basic	C	AccessBasic	Importance
Portability	1	3	1	3	1	0
Efficiency	1	3	1	3	1	1
Memory constraints	3	3	1	2	3	3
Output format	3	1	1	1	1	4
Writing effort	2	3	2	1	1	3
Code size	2	3	2	1	2	1
Debugging support	1	2	2	3	2	0
Availability	3	3	3	3	(0)	5
Weighted total	45	43	31	32	19	

Figure 1: Language strength matrix

The Gedcom format

A Gedcom file starts off with a header record, and then a number of records for individuals and families. An individual, identified using a flag like `@I23@`, has a name (or even several names), date and place of birth, occupation, space for miscellaneous notes, and so on. There is a large number of Gedcom field types, but almost all are optional; in fact, in a typical Gedcom file most are omitted because biographical records can be quite sparse and unreliable only a few generations back. Individuals are linked to each other via family records, which have identifiers like `@F45@`: a family record relates spouses, or parents and children. Thus a complete Gedcom file contains a number of individuals which reference one or more family records; and a number of families which contain references back to the members of the relationship. It is quite easy to understand, but ugly to look at. I am not going to provide any more rigorous definition of Gedcom (and to be honest, I have not done more than skimmed the Gedcom specification myself), but an annotated sample individual and family record can be found below. A complete specification of the format may be found via *http://genealogy.emcee.com/PAF/pafrevue/inf/geddoc.html*.

Individual record:

```
0 @I32@ INDI              This introduces an individual record
1 NAME Fred  /Bloggs/     Surname inside slashes
1 SEX M
1 OCCU Bus driver
1 BIRT
2 DATE 1 OCT 1925         Note nesting to indicate that this date
2 PLAC London             and place "belong" to the BIRTh field
1 DEAT
2 DATE 1 OCT 1995
2 PLAC Edinburgh
1 BURI
2 DATE 5 OCT 1995
2 PLAC London
1 FAMS @F5@               Family containing spouse information
1 FAMC @F10@              Family containing parent information
```

Family record:

```
0 @F5@ FAM                Introduces a family record
1 HUSB @I32@              References to members of the family
                          relationship
1 WIFE @I15@
1 CHIL @I30@
1 CHIL @I36@
1 CHIL @I37@
1 MARR                    Other details about this relationship
2 DATE 2 MAY 1944
2 PLAC Cambridge
```

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

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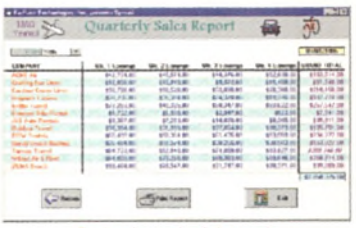

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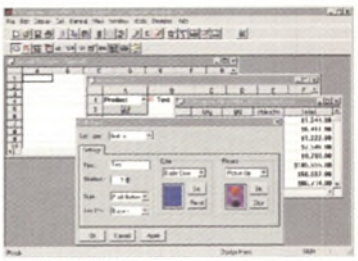

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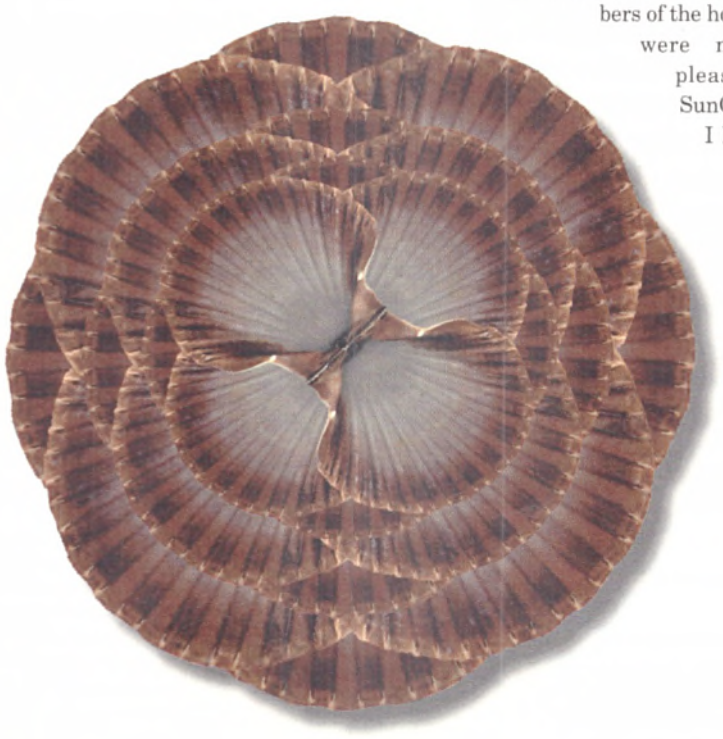
The Desktop Korn Shell

When he switched from SunOS to Solaris 2.5, **Peter Collinson** was looking for an easy way to add graphical front-ends to his existing programs. He discovered the Desktop Korn Shell...

I recently spent a happy week or so moving things around on my Sun to use Solaris 2.5 as its primary operating system. I had been using SunOS, latterly 4.1.4, but had always had the ability to boot and run Solaris. When Solaris 2.5 came in the door, I loaded the system, put up the Common Desktop Environment (CDE) and was hooked. If you can switch to using the CDE and have not done so, then I recommend it strongly. I reckoned on a week solid work to move all the bits and pieces of my working environment from SunOS to Solaris and was right. Actually, Solaris emulates SunOS very well, so you don't need to recompile and port things. It was a personal decision to do it.

However, the other members of the household were not too pleased. On SunOS 4.1.4, I had tailored a couple of copies of `xbiff` so they could see if they had mail waiting for them by just looking at my working screen. CDE mostly uses three-dimensional colour pixmaps for its images, and the old one-level bitmaps used by `xbiff` looked out of place. I began to look around the new system to find easy ways of creating applications that would fit in with the CDE style.



Well, there are several ways. First, the CDE comes with an application builder `dtbuilder`. The program allows you to design the GUI for your application using a visual drag-and-drop interface. Once you are happy with the image and have tested it, you can create the C code that implements the GUI. The program only gives you access to a subset of the full Motif Widget set, and this can be a problem. The code that it generates has well marked places where you can insert your own code to add semantics to the GUI. I found that it's easy to use for simple applications, but in the end does demand a high knowledge of how X works and how to convince the widget set to do the things that you want to do. It does seem to have rough edges, or perhaps I have been pushing it in ways that Motif does not want to go.

Sun also supplies a SparcWorks product, SparcWorks/Visual. I got a demo 30-days licence for it. Again, it seems to do all the good things, although I have not really looked at it seriously, largely because my knowledge of Motif widgets is building and I suspect that the program is better when you know more. Anyway, it seemed overkill for the job in hand.

I really wanted something that could be used to pull together GUIs in very short time. I can foresee the need to create little graphical front-ends to existing programs and I don't want to spend much time on cre-

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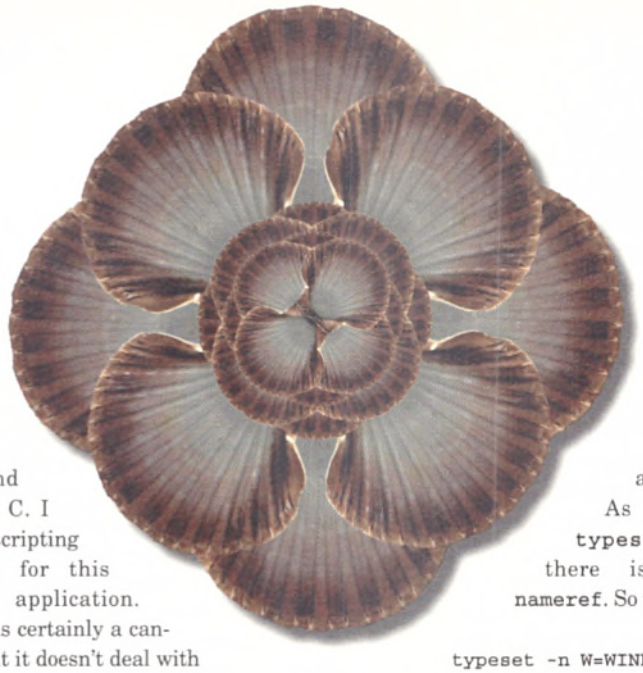

ating all the bits and pieces in C. I prefer a scripting language for this type of application. Tcl/Tk was certainly a candidate, but it doesn't deal with colour pixmaps. I suspect that there are extensions but have not really looked for them. I then chanced on the Desktop Korn Shell, or **dtksh**.

Korn shell 93

The desktop Korn Shell is an extended version of **ksh**. It's a standard part of the CDE specification, so there is no great problem with portability. It will be on any machine that runs CDE. The shell is based on the latest version of the Korn shell, **ksh**-93, and contains some new features that make programming easier. It's a shame that Sun is not tracking these features, so that the standard **ksh** on my machine is compatible.

The first area of change for **ksh** is the implementation of compound variables. This allows sets of related variables to be grouped together:

```
WINDOW=
WINDOW.X=567
WINDOW.Y=678
WINDOW.WIDTH=200
WINDOW.HEIGHT=150
```

It's necessary to define the base name, **WINDOW**. Also, when accessing the variables you need to use the **${...}** construction:

```
print ${WINDOW.X}
```

If you've used **ksh** for programming, you'll remember that the **print** command is a synonym for **echo**. A rename was needed to get around the ambiguity caused by the formatting characters introduced by System V. The **print** command has variants that permit data formatting.

Another nice new feature: you can now use the **typeset** command to specify that a name is a reference to another name. As with many **typeset** options, there is an alias: **nameref**. So the commands:

```
typeset -n W=WINDOW
nameref W=WINDOW
```

are equivalent. Now when we type:

```
print ${W.WIDTH}
```

we get 200, the value of the variable **${WINDOW.WIDTH}**. I've wanted this ability for some time in shell programming.

The Desktop Korn Shell, a standard part of the CDE specification, will be on any machine that runs CDE

Having a reference to a name allows us to pass values back from functions:

```
function corner {
   nameref w=$1 x=$2 y=$3
   (( x = ${w.X} + ${w.WIDTH} ))
   (( y = ${w.Y} + ${w.HEIGHT} ))
}
```

There are actually two ways to define functions in the shell for historical reasons. The second form is

```
corner() {
   ...
}
```

This is the way that Posix would like you to do things. However, the form that I have used with a **function** keyword allows the declaration of local variables whose scope disappears when the function exits. This is a win when defining small functions and procedures.

The second line, then, defines three local name reference variables that are set to point to each of the arguments of the function. We will call the function using something like:

```
integer X Y
corner WINDOW X Y
```

The next two lines of **corner**, in double brackets, are **ksh**'s builtin arithmetic statements and do the computation that we need. The source values will be taken from the **WINDOW** compound variable that we defined earlier. The destination of the computation is the variables that we specified when the function was called: **X** and **Y**.

In addition to implementing indexed arrays, **ksh**-93 supports associative arrays. These emerged originally in **awk** and are of great use when you are storing textual data with textual keys.

```
typeset -A name
name[pc]="Peter Collinson"
name[glyn]="Glyn Collinson"
for n in "${!name[@]}"
do
   print ${name[$n]}
done
```

The **"${!name[@]}"** syntax expands to the list of keys in the array. This is not exactly memorable syntax.

The last language modification that I will mention is the addition to the **for** statement so that it takes parameters that permit arithmetic, or C-style, loop control. For example:

```
for (( i = 0; i < 10; i++ ))
do
   print $i
done
```

The use of double brackets fits in with the syntax for general arithmetic statements. There are many other modifications in **ksh**-93 adding to the general power of the shell. They mostly make shell programming simpler, although some of the syntax is sometimes hard to deduce and read.

Motif from the shell

The **dtksh** program contains a bunch of new built-in commands which map directly onto the various layers of X library routines

allowing you to write Motif X applications in shell. The names of the commands are the same as the routine names in the X library and the calling convention translates directly, so you can pick up the standard X documentation and use `dtksh` instead of C.

Let's return to my original problem, writing a mailbox tracking program. The image pixmap is displayed using a simple label widget. Whether the mailbox is full or empty is shown by using two different colour pixmaps. In fact, the one trick in the script is to realise that you can use the notion of *sensitivity* to choose between the display of one or other of the different images. In X, you can mark a label as 'insensitive'. If a button contains a text label, then the letters are greyed out to show the user that the button is not accessible when the application is in the current state. When bitmaps or pixmaps are used, changing the sensitivity of an object alters the image that is displayed.

So, all I need to setup the GUI is the script below:

```
#!/usr/dt/bin/dtksh
XtInitialize TOPLEVEL gbiff Gbiff "$0"
"$@"
XmCreateLabel LABEL $TOPLEVEL label \
   labelType:PIXMAP \
   labelPixmap:DtMnew.l.pm \
   labelInsensitivePixmap:DtMail.l.pm
XtManageChild $LABEL
XtRealizeWidget $TOPLEVEL
XtMainLoop
```

If you haven't done any X programming, then this will look severely unfriendly, but X programmers will recognise the general pattern. Step 1, initialise X. Step 2, establish the widgets that you want to use and their correct relationship. Step 3, place the images on the screen. Step 4, call the main X event dispatcher to run the application.

Let's look briefly at the structure of the commands before delving into what they do. Each command maps onto an X routine call. Routines which return a widget handle, such as `XtInitialize` and `XmCreateLabel`, place the handle in their first argument. When the handle is needed to be passed into a widget, perhaps to indicate a parent, then the variable is simply placed on the line so it expands to its value.

The `XmCreateLabel` command is given some X resources, expressed as *name:value*. The name is exactly the same as that in the C language binding, but with the initial letters removed. So for `labelPixmap` the manual page would quote `XmNlabelPixmap`. Values are the same as those quoted in the C manual page. However, if the value contains any white space, then the value must be quoted.

The `gbiff` script starts with a call to `XtInitialize`, this is a `dtksh` convenience function that collapses into one call all the standard messing about that is necessary to get an X application running. The arguments are the widget handle used to later to reference the toplevel widget, the name and the class name of the application. These are followed by the name of the command (`$0`) and the arguments that the command has been given. This permits you to use any of the standard X command line arguments with the new command that you are creating.

The `XmCreateLabel` command is again given a place to put the widget handle that it will create: a variable called `LABEL`. The widget is a child of the `TOPLEVEL` widget, this is specified by argument two. The third argument names the widget, I've called it `label`. The remaining arguments set resources in the widget. They establish the fact that we will be using graphical pixmaps in the label rather than text and they supply the two pixmaps that I intend to use. Since these are standard CDE bitmaps and stored in a known place, I don't need to give a full pathname.

After all, all you ever set and get are values, so let's not type that word every time

The call to `XtManageChild` tells X to *manage* the label widget. The call is a little bit of X red tape, that announces to the parent widget that a new widget has been added to its hierarchy and it should worry about positioning its children. The `XtRealizeWidget` says 'go' to the parent widget. It creates its image and paints it onto the screen.

Finally, `XtMainLoop` is called to sit and wait for X events. In this application there is no return from this loop. The program will simply sit and display the 'sensitive' pixmap in a box on the screen. We need to add some code to make it do something.

The action of the program is to wait for some time, and then look at the size of a mailbox file stored somewhere on the system. If the mailbox exists and contains some data, then we want to use the sensitive pixmap to show this. If not, we want to show the insensitive pixmap.

We want to arrange that a routine called automatically from the clock looks at the file and makes the necessary changes to the GUI. Work in X is usually done in *callback* routines, called from inside the main loop when some event happens. The routine `XtAddTimeOut` adds a timer that sends a timeout event to the main loop after some fixed period. The main loop then calls the nominated routine. Here's the timer callback routine:

```
# Timer callback code
state=True
MAILBOX=/var/mail/glyn
function timerCB {
   typeset newstate
   if [ -s $MAILBOX ]
   then
      newstate=True
   else
      newstate=False
   fi
   if [ $state != $newstate ]
   then
      state=$newstate
      XtSetSensitive $LABEL $state
   fi
   XtAddTimeOut TOUT 15000 timerCB
}
```

This is a function with a single local variable: `newstate`. It accesses a couple of global variables: `state` that stores the last known state of the image and `MAILBOX`, the location of the file that we are examining regularly. The first `if` statement tests the `MAILBOX` file, if it exists and contains something, then `newstate` will be set to `True`. The `newstate` variable will be set to `False` if the file doesn't exist or has zero length. The `True` and `False` constants are understood by `dtksh`, they happen often in X parameters and resources.

Having deduced the current state of the mailbox, we proceed to change the image if this is required. We store the new state and

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use the `XtSetSensitive` function to select the pixmap to display for the widget whose handle is `LABEL`. Finally, we fire up the timeout again using `XtAddTimeOut`. The call returns a handle `TOUT` that we don't use. The remaining parameters are the time to wait in milliseconds, here 15 seconds, and the function to call when the timer fires. In this case, the function happens to be the function that we are now executing.

We have to initialise the timer in the display code that we did earlier to make it work the first time through. The best way of doing that is to place a call to `timerCB` just before the call to `XtMainLoop`. Once we have inserted this line, then `timerCB` must be defined when we execute the call. This implies that we must place the routine at the top of the program just after the `#!/usr/dt/bin/dtksh` line. Variable scope in the shell is an 'execution' scope not a textual one, so `timerCB` must be defined before it is called. Notice that `timerCB` uses the `LABEL` widget, so this must exist before the `timerCB` routine is called.

We now have a complete program of a very small number of lines. In use, I like to remove the normal title bar, borders, resize handles and the like that are added by the window manager. I do this by adding the line

```
*Gbiff*clientDecoration: none
```

to my `.Xdefaults` file, reloading the X resources and restarting the window manager. Incidentally, I still want to move the final image on the screen but cannot easily because I have removed all the external controls that permit moving, resizing etc. There is still a way to move the image. First, place the cursor inside the image, this may require a button click depending on how things are configured. Now select Alt and F7 from the keyboard. The application can be placed where you wish it to live on the screen. There is feedback to show that the window is in this state, the cursor changes to the little cross used to indicate that a move is taking place.

A book and a toolkit

I had come about this far when I happened to chance on a book written by Stephen Pendergrast, the author of `dtksh`. The book, *Desktop Korn Shell Graphical Programming* is excellent. Half of the volume introduces Motif widgets and the CDE, the other goes into more complicated uses of X. There are extensive sets of reference materials at the back of the book. In fact, the book is a great manual for how to code for Motif and the CDE.

The author uses his own toolkit that is written as `dtksh` aliases and functions. The toolkit is freely available on the net. The toolkit considerably simplifies the interface to X. For example, he has removed all the capitalisation in command names, so you don't spend time (as I did) working out that `XtAddTimeOut` has a capital 'O' for the last syllable. He has also provided shorter aliases for some of the names, so he has `XUset` and `XUget` rather than `XtSetValues` and `XtGetValues`. After all, all you ever set and get are values, so let's not type that word every time.

dtksh provides an easy way of prototyping GUIs that are to be created finally in C or C++

Many of the routines are simple mappings of a name into an equivalent Motif or CDE function. Some of the routines do a portion of the work that you would have to do otherwise. For example, his `XUlabel` routine arranges to manage the widget for you. He also provides several higher level functions. For example, menu creation is simply a matter of specifying some strings and callback functions. I think that the library is worth using, because it simplifies the work still further.

If you start looking at `dtksh`, you will find that it contains much more than just simple X mappings. It provides the necessary hooks to allow an application to use the CDE Help mechanism. Well behaved CDE applications are supposed to give help as a standard feature. There's a chapter in the book about how to do this. The shell provides hooks into the Tooltalk protocol used to provide drag and drop on the desktop. You can write shared libraries in C that add new direct functions and keywords straight into the shell.

One of the interesting aspects of `dtksh` is that it provides an easy way of prototyping GUIs that are to be created finally in C or C++. Because the X routines are being used directly, or there is a clearly identifiable mapping, then the final code will be easier to write. I guess this needs to be balanced against the WYSIWYG GUI design packages that are intended to generate C code directly.

I certainly plan to use the program to create small visual interfaces to existing command line programs such as Sam Leffler's HylaFax software. ■

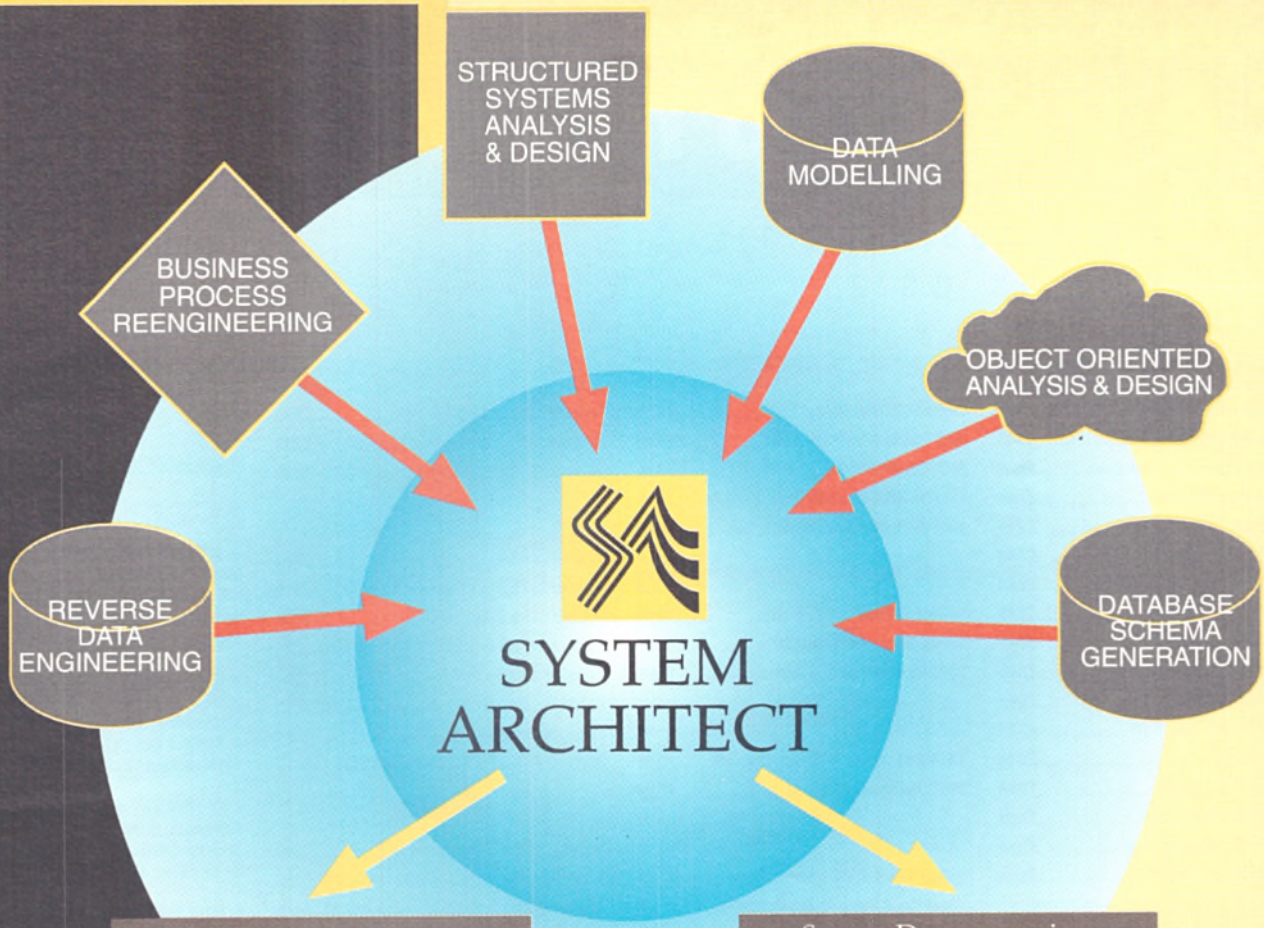
Peter Collinson is a freelance consultant specialising in UNIX. He can be reached electronically as pc@hillside.co.uk, by phone on 01227 761824 or on the Web at http://www.hillside.co.uk.

Further reading

The book *Desktop Korn Shell Graphical Programming* is by J. Stephen Pendergrast Jr. It's published by Addison-Wesley (ISBN 0-201-63375-2). The utility library software is obtained using anonymous FTP to `ftp.aw.com`, look in the directory `/aw.prof.computing.series/pend.dtksh`, the file `examples.tar.Z` contains the book examples and the utility file.

The CDE comes with a standard document on the shell. It's an Answerbook on my Solaris system, and is called the *Common Desktop Environment: Dtksh User's guide*. It is published jointly by Hewlett-Packard, International Business Machines, Novell and Sun MicroSystems, 1995. I've seen these manuals in hard copy printed form in a bookshop, but I have no idea of their ISBN.

The Motif bible is undoubtedly the two volumes from O'Reilly and Associates. The *Motif Programming Manual* is Volume Six A of the Definitive guides to the X Window system (ISBN 1-56592-016-3). Volume Six B is the *Motif Reference Manual* (ISBN 1-56592-038-4). These two books add up to a total of 1880 pages neglecting any prefaces.



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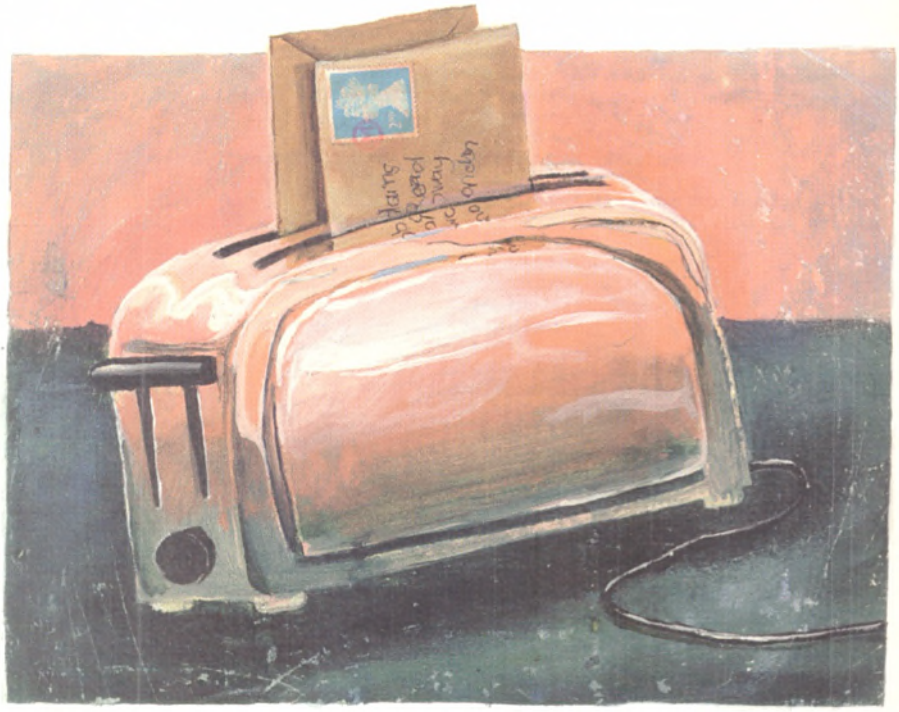
Something popped up

The Windows for Workgroups and Windows 95 APIs include a little-publicised but rather useful API for sending popup messages. **Will Watts** has been delving with Delphi.



WinPopup is a curiously unluscious fruit. You may have forgotten it already: installed in the Startup group by Windows for Workgroups, it popped up a pointless and frequently untruthful 'Your job has been printed' dialog every time you printed something (the computer equivalent to a Chinese fortune cookie motto which reads 'You are about to finish your coffee and leave the restaurant'), until you found the moral courage to delete it, or at least turn off the popping up.

Yet as Novell NetWare types will know, there are legitimate uses for such a program. The similar NetPopup application is used by NetWare and all manner of third party applications to report useful information, eg 'The server is running out of disk space', 'You have new email', and, of course, 'Your print job has just wrapped itself around the spindle of the printer's bottom roller'. Why can't WinPopup be like that?

No reason that I can see, except that the WinPopup API is documented only in the sheltered backwaters and hidden inlets of the MSDN CD-ROM set. Nobody knows how to use the damn thing. In this article I hope to put matters to rights: there is sufficient networking information here to re-implement the whole WinPopup application; and for the less ambitious, it documents the single API call necessary to pop up a dialog on any machine on a Microsoft network with NetBIOS (and OS/2 machines too, by the way). My 16-bit Delphi code was designed with Windows for Workgroups in mind, but also functions on Windows 95 and, with one noted exception, Windows NT.

Mailslots

It turns out that WinPopup depends upon an old Lan Manager system of interprocess communication called *mailslots*. You do not hear much about mailslots these days of Network OLE and what not. They are rather primitive, but there again they are easy to use.

Mailslots allow you to send data in one direction only: into the process that owns them. They are used as follows. First, the program at the receiving end initialises a mailslot; giving it a name, an overall buffer size (maximum size is 64 KB: recall we are back in the Land of the Segmented) and a message size. The mailslot name must be unique on that particular PC. Once initialised, other processes – which can either be on the same machine or elsewhere on the network – can write to the mailslot. Data is written as discrete 'messages' – ie blocks of data with a predetermined maximum size, as opposed to a socket-style stream. Each message has an associated priority.

At the reading end, the receiving program can interrogate its mailslot to discover how many messages it has, and extract them from the buffer. The messages are kept sorted by priority, then order of arrival, and are extracted in this order. The receiver must poll its mailslot regularly – there are no notifications when a new mailslot message arrives. Finally, the receiver should delete its mailslot before exiting.

A word about mailslot names. When you create a mailslot, you supply an ASCII name in the general form `\MAILSLOT\<name>`, for

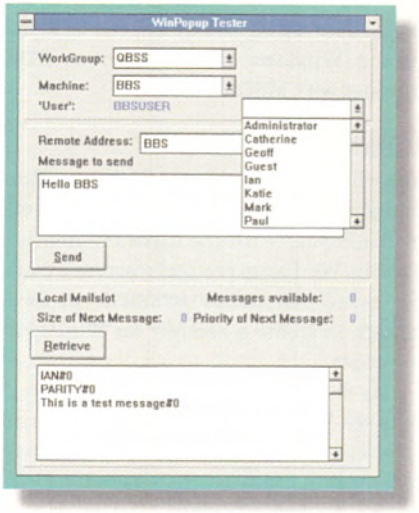


Figure 1 - The WinPopup test application

```
{ Delete mailslot, discarding all messages }
function DosDeleteMailslot(hMailslot: Word): Word; far; external 'netapi' {index 501};

{ Get mailslot size, message size, priority, and count }
function DosMailslotInfo(hMailslot: Word;
                  pcbMessageSize: PWord;
                  pcbMailslotSize: PWord;
                  pcbNextSize: PWord;
                  pusNextPriority: PWord;
                  pcMessages: PWord): Word; far; external 'netapi' {index 502};

{ Create mailslot using specified size, message size }
function DosMakeMailslot(Const pszName: PChar;
                  cbMessageSize: Word;
                  cbMailslotSize: Word;
                  phMailslot: PWord): Word; far; external 'netapi' {index 503};

{ Read a message and remove it from the mailslot }
function DosReadMailslot(hMailslot: Word;
                  pbBuffer: PChar;
                  pcbReturned: PWord;
                  pcbNextSize: PWord;
                  pusNextPriority: PWord;
                  cTimeout: LongInt): Word; far; external 'netapi' {index 523};

{ Write message of specified length, priority, class }
function DosWriteMailslot(Const pszName: PChar;
                  Const pbBuffer: PChar;
                  cbBuffer: Byte;
                  usPriority: Byte;
                  usClass: Byte;
                  cTimeout: LongInt): Word; far; external 'netapi' {index 524};
```

Listing 1 – The principal mailslot functions

example `\MAILSLOT\MYSLOT`. As noted above, the name must be unique on the machine where the mailslot lives. To address the mailslot from another machine on the network, one uses the UNC system, familiar to all those who have ever connected to a network resource. You just prepend a double backslash and the host machine's name to the mailslot name. So a mailslot called `\MAILSLOT\MYSLOT` on machine `PARITY` is addressed as `\\PARITY\MAILSLOT\MYSLOT`.

Listing 1 contains Delphi declarations for the principal mailslot functions, which are all found in a Windows DLL called NETAPI.DLL. C versions of these declarations, together with details of the functions I deemed too boring to include, can be found in the Windows for Workgroups SDK included with MSDN.

Building a receiver

You will have noticed how well the specification of mailslots maps onto the requirements of WinPopup. With the extra information that the WinPopup protocol reserves a mailslot called `\MAILSLOT\MESSNGR`, we have enough to create a receiver for WinPopup messages.

My demo application shown in Figure 1 receives WinPopup messages. In its form creation event, it tries to make a WinPopup mailslot:

```
err := DosMakeMailslot(
  '\MAILSLOT\MESSNGR',
  1024, 4096, @hMailslot);
```

As with all these network functions, a non-zero return is a failure. In my experience, the most likely causes of failure of `DosMakeMailslot` are:

- The real WinPopup is already running on the machine, and has of course already opened the MESSNGR mailslot itself. A corollary of this is that you need two machines to yourself to test these functions against WinPopup.
- The Windows for Workgroups/Windows 95 installation has 'rusted' through lack of use: make sure that the real WinPopup runs properly before proceeding. Of course, if you follow this advice, you are more likely to fall foul of trap one above.

Once the `MESSNGR` mailslot has been created, the test application uses a one second timer event to poll the mailslot's status and update the 'Messages available', 'Size of Next Message' and 'Priority of Next Message' labels displayed in the bottom panel of its form. This information is obtained from a single call to `DosMailslotInfo`.

To display a message's content, the user clicks the 'Retrieve' button and the program copies the contents of the first message in the mailslot into a `TMemo` (ie a multiline edit box) called `RetrieveMsg`. The code that does this is given in Listing 2. As you can see from the screen shot, the message is actually three zero-terminated strings: the sender, receiver and message content. Obviously in a 'real' program one would treat these separately.

You should also note that I live dangerously and assume that the data from the last timed call to `DosMailslotInfo` is still current. If a longer message of higher priority has arrived in the meantime then we could be looking down the wrong end of a GPF. I reckon that this never happens because of the way WinPopup is used in real life, but the prudent may like to put in another call to `DosMailslotInfo`.

It is this receiver part of the test application that fails under Windows NT, by the way, even if one disables the Messenger service in the Services Manager in NT's Control

```
procedure TPopupTest.RetMessageBtClick(Sender: TObject);
{Respond to 'Retrieve' button click}
var
   MsgText, LinePtr : Pchar;
   MsgLen : Word;
begin
   { cMessages and cbMessageSize predetermined by call to
     DosMailslotInfo - could be out of date, but take a chance}
   if cMessages = 0 then
      Exit;
   Screen.Cursor := crHourglass; { Show hourglass cursor }
   try
      GetMem(MsgText,cbMessageSize);
      DosReadMailslot(hMailslot, MsgText, @MsgLen, @cbNextSize, @usNextPriority, 500);
      RetrieveMsg.Lines.Clear;
      LinePtr := MsgText;
      while MsgLen > 0 do
      begin
         RetrieveMsg.Lines.Add(strpas(LinePtr) + '#0');
         Dec(MsgLen, StrLen(LinePtr) + 1);
         Inc(LinePtr,StrLen(LinePtr) + 1);
      end;
      FreeMem(MsgText,cbMessageSize);
   finally
      Screen.Cursor := crDefault;
   end;
end;
```

Listing 2 – Retrieving a mailslot message into a Tmemo

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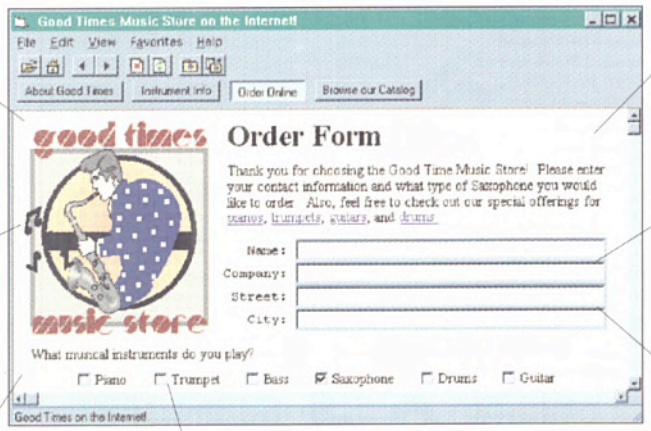

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Panel. If anybody knows why this is, I should be grateful for an explanation.

Sending messages

Symmetry suggests that, to send a message, a call to `DosWriteMailslot` is in order. Certainly this can be made to work, but there is a better way: `NetMessageBufferSend` (NMBS). Here is the function's Delphi declaration:

```
function NetMessageBufferSend(
  Const pszServer: PChar;
  pszRecipient: PChar;

  pbBuffer: PChar;
  cbBuffer: Byte): Word; far;
external 'netapi' {index 525};
```

To explain the parameters: `pszServer` is best left as `nil` – if you want to know more, please read it up in your own time. `pbBuffer` and `cbBuffer` contain the pointer to and length of the message respectively. `pszRecipient` is the most interesting parameter. Obviously a zero-terminated string containing the recipient's name; but is the recipient a person or a machine?

In fact it can be a machine *or* a logon name or, if you want to bother everybody on your workgroup simultaneously, it can be the * wild card. NMBS's ability to send to people by logon name is what makes it superior to direct mailslot access.

NMBS has a number of peccadilloes. You will discover at once that it is slow. I suspect that the mechanism works by broadcasting an 'Is Mike logged on anywhere?' type message to the network and then twiddling its thumbs for a couple of seconds to give everybody a chance to reply. Anyway, stick up an hourglass cursor before calling or your users may lose faith.

Another feature, a veritable oddity, detained your esteemed Editor and myself in the *EXE* offices for three frustrating hours one evening last summer. It seems that this function sometimes prefers Delphi's bounds checking switched on before it gets called. No, really. Yes, we did look over the code thoroughly. Yes, we know it doesn't make sense. Stop looking at me like that. Look, I'm not going to argue with you, but if you find yourself getting GP faults when calling this function, try slipping in a `{$R+}` on the line before you make the call.

A more conventional hazard of the function is blowing the maximum message length. Experiment and documentation suggest this is 256 characters for ordinary messages and 128 for broadcast messages where a * has been used for the recipient. Talking of documentation, don't bother looking for this function in the Windows for Workgroups SDK help file – it ain't there. However, you will find it covered in the Lan Manager Programmer's Tool Kit (LM PTK) documentation. This is a QuickHelp file of such enormous age that, to my delight, NMBS's entry explains that while 'MS OS/2 version 1.2 and 1.3, local and remote [are compatible,] MS OS/2 version 1.1 [is] not supported'. Those were the days. The LM PTK is on MSDN sets from July '95.

Listing 3 shows how my example application handles a click event on its 'Send' button: it uses NMBS to send the contents of the `TMemo` called `Memo1` to the recipient held in the `TEdit` called `RemoteAddrEd`.

```
procedure TPopupTest.SendMessageBtClick(Sender: TObject);
var
   pszRecipient : array[0..256] of Char;
   err, cbBuffer : Word;
   i : Integer;
   pbBuffer, tempptr : PChar;
   msg : String;
begin
   Screen.Cursor := crHourglass; { Show hourglass cursor }
   try
      strpcopy(pszRecipient,RemoteAddrEd.Text);
      cbBuffer := 0;
      for i := 1 to Memo1.Lines.Count do
      begin
         cbBuffer := cbBuffer + Length(Memo1.Lines[Pred(i)]) + 1;
      end;
      GetMem(pbBuffer, cbBuffer);
      try
         tempptr := pbBuffer;
         for i := 1 to Memo1.Lines.Count do
         begin
            strpcopy(tempptr, Memo1.Lines[Pred(i)]);
            tempptr := tempptr + Length(Memo1.Lines[Pred(i)]) + 1;
         end;
{$R+} {Don't knock this - it works!}
         err := NetMessageBufferSend (nil, pszRecipient, pbBuffer, cbBuffer );
{$R-}
         if err <> 0 then
         begin
            Screen.Cursor := crDefault;
            case err of
               ERROR_BAD_NETPATH:
                  msg := 'Bad Network Name';
               else
                  msg := 'Rather strange error...';
            end;
            MessageDlg('Message not sent - ' + msg, mtWarning, [mbOk], 0);
         end;
      finally
         FreeMem(pbBuffer, cbBuffer);
      end;
   finally
      Screen.Cursor := crDefault;
   end;
end;
```

Listing 3 – Sending a WinPopup message

Who is out there?

I promised at the outset to provide sufficient information to re-implement WinPopup. One feature of the original is that it allows you to browse through a list of machines to choose a recipient. The function one needs to obtain this list is a veritable monster:

```
function NetServerEnum2(
  Const pszServer: PChar;
  sLevel: ShortInt;
  pbBuffer: PChar;
  cbBuffer: Word;
  pcEntriesRead: PWord;
  pcTotalAvail: PWord;
  flServerType: LongInt;
  pszDomain: PChar): Word; far;
    external 'netapi' {index 528};
```

Horrid, eh? It gets worse when I start to explain the parameters. Microsoft says `pszServer` must be `nil`, so that's ok; `sLevel` can be 0 or 1 and affects the amount of information you get back. Let's pretend it's always 0, so that I can say that, on return, `pbBuffer` will be filled with `server_info_0` records. A `server_info_0` is just a short C style character string defined in an obscure way:

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```
procedure TPopupTest.WorkGroupComboBoxChange(Sender: TObject);
var
   psi0 : ^server_info_0_array;
   cEntriesRead : integer;
   cTotalAvail : integer;
   cb, err : Integer;
   i : Integer;
begin
   Screen.Cursor := crHourglass; { Show hourglass cursor }
   try
      { Determine how much information is available}
      err := NetServerEnum2(nil, 0, nil, 0, @cEntriesRead,
                            @cTotalAvail, SV_TYPE_ALL, nil);
      if (err <> ERROR_MORE_DATA) then
         { error, no information available }
         exit;

         { Allocate memory to receive the information }
      cb := cTotalAvail * sizeof(server_info_0);
      getmem(psi0, cb);
      try
         { Retrieve list of workstations }
         err := NetServerEnum2(nil, 0, Pchar(psi0), cb, @cEntriesRead,
                               @cTotalAvail, SV_TYPE_ALL, workgrpstr);
         if (err = NERR_Success) then
         begin
            MachineComboBox.Items.Clear;
            for i := 0 to pred(cTotalAvail) do
               MachineComboBox.Items.Add(psi0^[i].sv0_name);
            MachineComboBox.ItemIndex := 0; {Make first machine default}
            MachineComboBoxChange(Sender);
         end;
      finally
         FreeMem(psi0, cb);
      end;
   finally
      Screen.Cursor := crDefault; { Always restore to normal }
   end;
end;
```

Listing 4 – Obtaining a list of machines in our workgroup

```
Const CNLEN = 15;
      { Computer name length }
...
type
 server_info_0 =
  record
   sv0_name:array[0..CNLEN] of char;
  end;
```

So after the call, the `server_info_0` records contain the names of the machines of the current workgroup; `cbBuffer` is another input parameter, the length of the `pbBuffer`; `pcEntriesRead` returns the number of records we actually have in `pbBuffer`, as opposed to `pcTotalAvail`, which gives us the total number of machines for the workgroup; `flServerType` is an input parameter which we will set to `$FFFFFFF` because I say so; `pszDomain` allows you to switch workgroups, and may safely be left at `nil`.

How does one make sure that `cbBuffer` is sufficiently large to take the names of all the workstations? You can't call `NetServerEnum2` until you know how big to make the buffer, and the only way to find out how big the buffer should be is... to call `NetServerEnum2`.

Listing 4 shows the officially sanctioned method of getting around this problem: you call the function twice. First time, set `cbBuffer` to 0 so that `pbBuffer` is unused. On return, provided that the error return is `ERROR_MORE_DATA`, then `cTotalAvail` will contain the total number of machines on the network. All we need do is grab a memory block size `sizeof(server_info_0)*cTotalAvail` for `pbBuffer` and call `NetServerEnum2` again.

My sample stows the hard-gotten booty from this function into a combo box called `MachineComboBox`. Again, this is one of those Workgroups functions that sometimes seems to take half an hour to run, so for politeness sake I show an hourglass while `NetServerEnum2` does its stuff.

You will be pleased to know that `NetServerEnum2` is fully documented in the Windows for Workgroups SDK.

Pop up tip

Finally, a gratuitous WinPopup tip which I happened upon recently. If you place the line

```
SendPrintMessages=no
```

in the `[Network]` section of `SYSTEM.INI` on a Windows for Workgroups printer server, then it will suppress those silly print notification messages. [*Anyone knows how to do this under NT? – Ed*]. Happy popping. ■

Will Watts lives and works in Chiswick. He does not own a cat.

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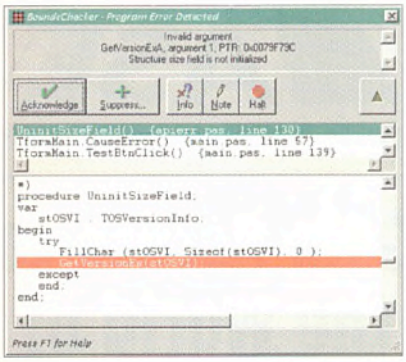

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Extended x86

Intel is promising that with the multimedia extensions to be included in its future processors, soon tortoise-like applications will become speedy. **Andrew Ward** explains what developers should expect from the MMX technology.

For the first time in over ten years, since the 386 processor was first introduced, Intel has announced the incorporation of significant new instructions into the x86 architecture. The 57 new instructions, together with new data types and even new arithmetic operations will, it is claimed, result in a performance improvement of between 1.5 and 2 times on many multimedia applications, with certain functions and features performing many times faster.

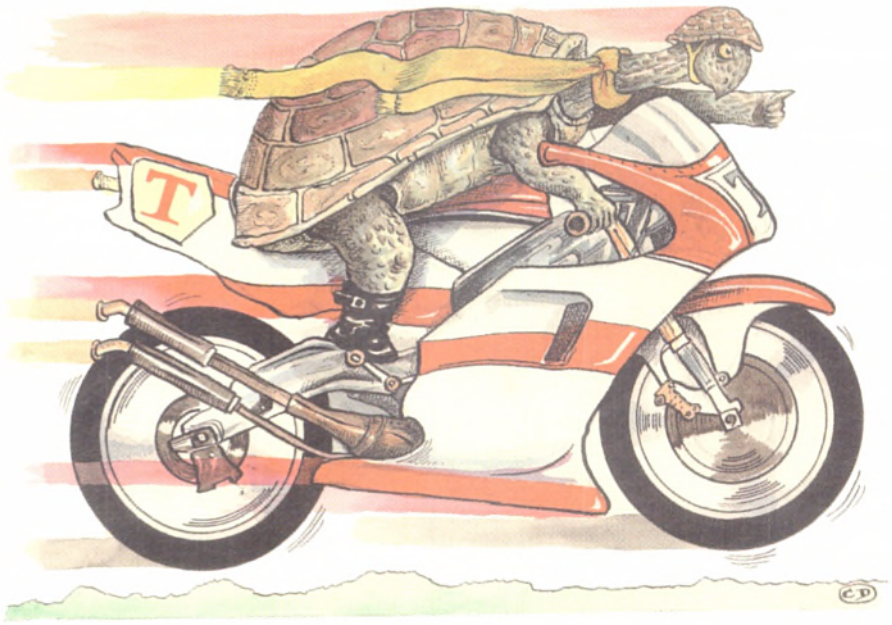
PC users had to wait ten years for a mainstream desktop operating system which made full and effective use of the 386 architecture and instructions; this time, Intel has given plenty of warning of its new multimedia extensions (MMX) technology, let's hope users can reap the benefits as soon as the silicon is available.

Processors

These new MMX instructions will eventually appear on all the Pentium and Pentium Pro processors in Intel's range, and will presumably be carried forwards in any future x86 family products. It's not Intel's intention to concurrently produce 'with MMX' and 'without MMX' devices, but it will take a while for MMX to be introduced throughout the range. The first processor to incorporate MMX technology, codenamed P55C, will appear towards the end of 1996, and Intel expects the whole range to have been updated by the end of 1997.

From the programmer's point of view, there is therefore a reasonable amount of time available to learn about these new features and introduce them into applications; and, according to Intel's predictions, we can be reasonably confident that it will be worthwhile, because before 1997 is finished all new sales of Intel-based PCs should incorporate these instructions.

Whether or not these instructions become incorporated into x86 processors from suppliers other than Intel remains to be seen: but Intel has given enough advance notice that there is plenty of time for CPU cloners to get to work, and they have much to gain on performance grounds by emulating these instructions.



One goal: multimedia

Intel suggests that these new instructions have been specifically targeted at the multimedia application because it's in this area that it sees substantial growth occurring. What's interesting is that, at relatively little cost in terms of silicon, Intel has achieved a performance boost of 1.5 to 2 times for many applications, roughly equivalent to that normally only obtained from a complete new generation of processor technology.

Of course, there are some advantages from Intel's point of view in using MMX technology rather than completely re-engineering its processors. For once, the burden (albeit a small one) of taking advantage of the new speed-ups is placed on the programmer, rather than on the CPU designer. Secondly, over the years Intel has had to be extraordinarily imaginative in its implementation of superscalar and dynamic execution technology to squeeze more and more performance from the x86 CISC design – a design with many features (such as the flags register) which impose awkward restrictions on

scaleability – so the requirement for a considerable amount of ingenuity has been saved, or at least postponed for a while.

Performance is very important for Intel, now that the Alpha is being taking seriously. Intel is coming from way behind in performance terms: in the same week as the MMX announcement, Digital launched 366 and 400 MHz samples of the Alpha 21164, with 433 and 500 MHz versions to follow later in the year – the 500 MHz version will appear at about the same time as the P55C. See Table 1 for comparative performance.

Intel is not unique in producing instructions specifically aimed at improving performance of multimedia applications. Sun's UltraSPARC technology includes the Visual Instruction Set (VIS), designed to dramatically increase a processor's throughput by executing complex graphics operations on the chip. VIS instructions include pixel arithmetic, format and conversion instructions, also capable of operating on several pixels (8- or 16-bit) at once. For example, one VIS instruction calculates the sum of the absolute differences between two 8-pixel vectors. Without VIS, this operation would require 48 instructions. Sun claims that VIS provides a four times or higher speedup for most of the time-critical computations, for video decompression for example.

Choice of instructions

Introducing new instructions to the well established 386 set is a major step for Intel. It was necessary for Intel to choose instructions that would benefit as broad a range of applications as possible, for the minimum possible payment in terms of silicon. What Intel did was to work with developers of a wide range of applications to identify the compute-intensive routines.

They found that over the software applications analysed, which included graphics, MPEG video, music synthesis, speech compression, speech recognition, image processing, games, video conferencing and others, the most compute-intensive routines shared many common features, including small integer data types (typically, 8- or 16-bit), small, highly repetitive loops, and frequent multiplies and accumulates.

The MMX instructions are based on a technique called SIMD (Single Instruction, Multiple Data) where an instruction works on many different data items in parallel (for example, one instruction adds eight pairs of 8-bit numbers, held within 64-bit registers). The new instructions are not privileged.

All MMX instructions use the normal x86 addressing modes, and the same two-operand (source and destination) encoding schemes. No MMX instructions affect the condition flags.

Compatibility

Of course, retaining compatibility with existing applications and operating systems was a primary design goal. For these new instructions to be effective they needed new registers to operate on. The difficulty is, of course, that these new registers will have to be saved when operating context switches. To overcome this problem Intel has mapped the eight 64-bit wide MMX registers onto the mantissa portion of the floating point registers: existing operating systems will thus automatically save and restore the MMX registers when they save and restore floating point state. MMX registers are mapped to the physical floating point registers, not relative to the logical one indicated by the Top of Stack bits.

Of course, the downside of sharing the floating point registers in this way is that an application cannot mix MMX and floating point instructions, for they use the same set of registers. The reality is that this really won't ever be a problem to the type of application which MMX is designed to help; floating-point instructions won't be in use in these tight, hand-coded, inner loops within multimedia programs.

Floating-point and MMX code can be used in the same application, as long as a few simple rules are obeyed. Currently, there's an unwritten rule that the floating point stack is always left empty (although

Processor	SPECint95	SPECfp95
Alpha 21164 400 MHz	11.7	15.9
Intel Pentium Pro 200 MHz	8.09	6.70

Table 1 – Comparative performance

any responsible programmer would explicitly clear it rather than relying on that assumption). To coexist with MMX code that rule should be followed at the end of any floating-point code segment. An instruction has been created for this purpose, `EMMS`, which the programmer can use to explicitly clear the MMX registers at the end of any MMX code segment, thereby leaving the floating point registers empty.

Careful reading of the documentation is essential, as there are a few minor things to watch out for. For example, if the coprocessor emulation bit (`CR0.EM`) is set, an attempt to execute an MMX instruction results in an invalid opcode exception (interrupt 6). This happens because when `CR0.EM` is set the operating system assumes that software emulation of floating-point instructions is in use, and won't save and restore the floating point registers (and hence the MMX registers).

The new instructions all use reserved opcodes. So that applications developed for MMX can be written to run on non-MMX processors, the `CPUID` instruction can be

Category	Type	Variants	Operands
arithmetic	add and subtract	wrap-around	byte, word, dword
		signed with saturation	byte, word
		unsigned with saturation	byte, word
	multiply	retains only high order result	words
		retains only low order result	words
	multiply and add		words
comparison	equal		byte, word, dword
	greater than		byte, word, dword
conversion	pack	unsigned with saturation	words (into bytes)
		signed with saturation	words, dwords
	unpack (interleave)	high order	bytes, words, dwords
		low order	bytes, words, dwords
logical	and	bitwise	64 bits
	and not	bitwise	64 bits
	or	bitwise	64 bits
	xor	bitwise	64 bits
shift	left	logical	word, dword, qword
	right	logical	word, dword, qword
		arithmetic	word, dword
data transfer	move	to or from MMX register	dword, qword
state	empty MMX	empties MMX state	

Table 2 – Instruction summary

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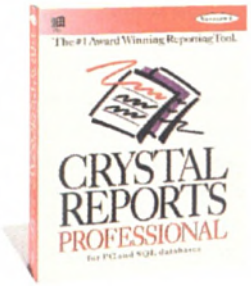

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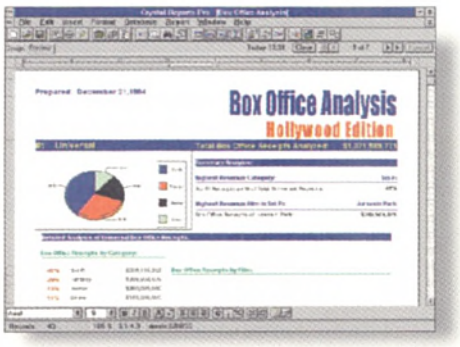

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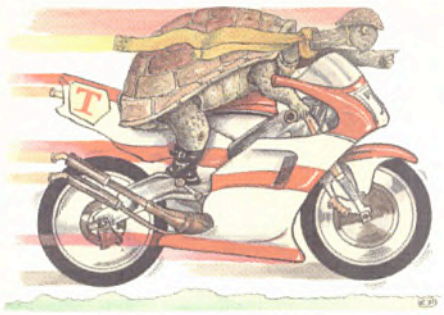

used to determine whether MMX technology is present, using a code fragment like this:

```
; request feature flags
mov  EAX,1
CPUID
; test MMX present bit
test EDX, 1 SHL 23
jnz  MMX_technology_present
```

Four data types

MMX technology uses four data types. The eight MMX registers are each 64 bits long and the data types typically consist of smaller data items 'packed' into these 64-bit registers, as follows:

- packed byte – eight bytes packed into one 64-bit quantity
- packed word – four words packed into one 64-bit quantity
- packed doubleword – two 32-bit double words packed into one 64-bit quantity
- quadword – one 64-bit quantity

These data types are designed to fit well with multimedia data types. For example, graphics data are typically represented by 8-bit pixel quantities. With the packed byte data type, an MMX instruction can operate on eight 8-bit pixel values at once. Data elements are packed rather as you would expect (see Figure 1).

Instruction types

A summary of all the new instructions included in the MMX instructions set can be found in Table 2. The MMX technology introduces some new arithmetic types: addition and subtraction (signed or unsigned) with *saturation*. Intel found that much multimedia data representing real-world analogue values, such as video and audio values, has a limiting maximum value. During addition, programmers often have to check for wrap-around and then perform software 'clipping', or 'limiting', to return the result to the saturated value. For example, you can't get more white than white!

Figure 2 shows how, in Intel's saturation arithmetic, adding two values that would normally overflow, instead, produces a maximum result. The example uses unsigned saturated addition of two 64-bit quantities containing packed 16-bit words. Normally, we would expect 0xEFFF + 0x2000 to be 0x0FFF, a wrap-around value. With saturation, the result is limited to the maximum value appropriate to the data type, hence 0xFFFF. The new MMX instruction set does also include wrap-around add, whereby 0xEFFF + 0x2000 does become 0x0FFF. In this case, the overflow bit is lost (completely lost: no flag bits are set).

Many signal processing algorithms such as vector-dot products, matrix multiplies and various sorts of filters make extensive use of multiply-accumulate operations. The packed multiply add instruction (`PMADD`), is directly addressed at these algorithms. Figure 3 shows how it works on two MMX registers each containing four 16-bit word values. The `PMADD` instruction does four multiplies and two adds. As can be seen, the `PMADD` instruction uses 16-bit packed data and produces a 32-bit packed result. Multiply-accumulate operations would typically require this result to be added to another register, used as an accumulator.

Another very useful group of instructions are the compare instructions. These actually create a data value as a result of a comparison, rather than setting a condition flag. Operations requiring selection of different data values following comparisons occur very widely in signal processing; the most obvious example is the Chroma keying 'weather man' situation. The example in Figure 4 uses the compare-equal instruction `PCMPEQW` to test for the blue background. The result will be a bit-mask that we can then use to mask out the weather map. Note that read-modify-write is still required to apply the mask to a memory image; there's no short-cut to that part of the operation.

There is a number of 64-bit bitwise logical instructions which help with using the data result to process the two images. To select the weather man, we use `PANDN` (an `AND NOT` instruction) to block out the blue background. To select the weather map, we use `PAND`; finally, we can combine the two intermediate results to produce the final image using `POR`. This example uses 16-bit pixels but 8-bit pixels can be handled in the same way. Considerably fewer instructions are required using MMX technology, conditional branches are saved, and several pixels can be handled at the same time.

The pack and unpack instructions are there to convert data between different packed data types, for example by unpacking bytes into words, or by packing words into bytes. Often, in the process of executing an algorithm, a higher precision is needed at some stage than the source and/or the destination data type, so an unpack-calculate-pack sequence can be used.

Performance improvement

The impressive speed advantage that Intel is promising comes from two sources. Performing arithmetic on several data elements at once is much faster than doing it one at a time: adding four words in one instruction is four times faster than using four separate instructions. All the MMX instructions operate in one cycle, except the multiply/add instruction which takes three: but the pipeline features of the Pentium and Pentium Pro mean that one multiply/add instruction may be issued every cycle, resulting in an effective single-cycle instruction time.

The other reason for the speed-up is that, quite often, the new MMX instructions are replacing code that included conditional jumps. Conditional jumps have severe performance implications for a deeply pipelined processor such as the Pentium Pro, especially when working on multimedia data, where the random nature of the data makes accurate jump prediction (on which the processor relies to keep the pipeline full) more difficult. Hence, elimination of the jumps needed for comparison and overflow checking will result in a greater-than-expected performance boost.

Application examples

Here's an example of using the `PMADD` instruction in a vector dot-product calculation. Vector dot products occur very widely in algorithms which process natural data such as images and sounds. In this example we'll multiply and add the elements of two eight-element vectors, a() and c(), each containing 16-bit values:

$$x = \sum a(i) * c(i)$$

Normally, we'd have to load and multiply the eight pairs of terms individually, requiring eight multiplication instructions and seven additions. In fact, the total number of

63	56	55	48	47	40	39	32	31	24	23	16	15	8	7	0
7 b7	0	7 b6	0	7 b5	0	7 b4	0	7 b3	0	7 b2	0	7 b1	0	7 b0	0

Figure 1 - Packed byte format

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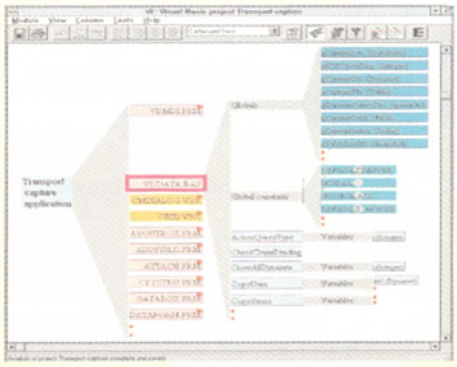

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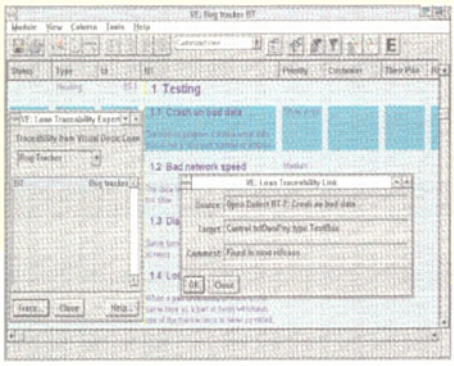

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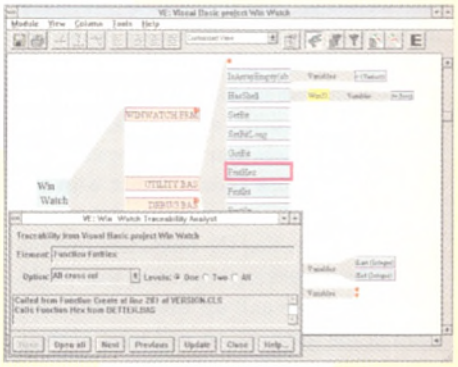

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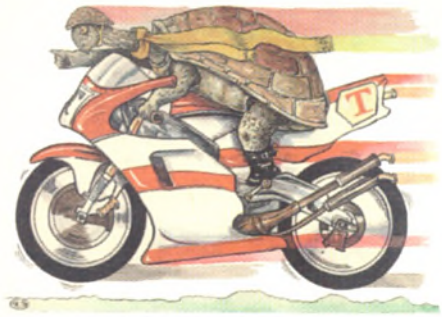

a3	a2	a1	0xEFFF
+	+	+	+
b3	b2	b1	0x2000
=	=	=	=
a3 + b3	a2 + b2	a1 + b1	0xFFF

Figure 2 – Saturated addition of two 64-bit quantities containing packed 16-bit words

a3	a2	a1	a0
*	*	*	*
b3	b2	b1	b0
=			
a3*b3 + a2*b2		a1*b1+a0*b0	

Figure 3 – The new instruction packed multiply add: PMADD does four multiplies and two adds

blue	not blue	blue	not blue
PCMPEQW			
blue	blue	blue	blue
=			
0xFFFF	0x0000	0xFFFF	0x0000

Figure 4 – The compare-equal instruction PCMPEQW to test for the blue background

instructions required without MMX technology is about 40. Using MMX technology, we can load four of the a() vector's elements into one MMX register with just one instruction, and then use the `PMADD` instruction (which can take the memory location of c() as an operand) to multiply with four of the c() vector's elements. `PMADD` also adds two of the pairs for us. A second `PMADD` can be used in the same way to multiply the other four elements of the two vectors. We now have two intermediate results, each containing two terms; to add these four terms together, we use a couple more adds together with the appropriate shifts to ensure the right precision. Even including the final store instruction and any packing/unpacking that might be required, we end up with around one-third of the instructions, and most of them execute in one cycle.

Another example which shows off the MMX instructions to good effect is Alpha blending: when one image dissolves to another, for example, a frog to a princess. To achieve such a dissolve, we need to multiply the intensity of each frog pixel by one alpha value (gradually moving from 255 to 0), and each princess pixel by another (gradually moving from 0 to 255). This is an obvious candidate for the `PMUL` instruction: we multiply the frog pixels by one value, and the princess pixels by another, and then use `PADD` to add the results.

In this case, we're dealing with 8-bit pixels, but the `PMUL` instructions only work on words. To start with, we'll have to unpack the 8-bit data to 16-bit MMX register format, and to finish up, use a pack instruction to return the 16-bit result to 8-bit format: with saturation, of course.

To carry out this operation with MMX on a 640 x 480 resolution image through all 256 possible alpha values would result in about half-a-billion instructions. The same operation without MMX requires about three times that number.

How to use MMX

The first step in considering when to use MMX technology is to identify those areas of integer code which are most heavily used, because it's those areas where the benefit will potentially be the greatest. Intel is developing an application profiling tool, VTune, which will assist the programmer in carrying out this task. VTune will appear later in the year and will offer other hints, such as the efficiency with which the pipeline and execution units are being employed.

If you currently use floating-point code, it might be worth considering whether you really need the precision and dynamic range offered by floating-point. If not, using integer MMX code would produce a substantial performance boost.

Those routines where MMX technology can be used should be placed in a library routine, or DLL, and then only used if `CPUID` reports the presence of MMX. Ideally, programmers will go beyond this, and rather than simply making the program go faster if MMX technology is present, they will offer the user additional features. For example, in 3D games, the sky is often depicted as a single, flat colour. When MMX technology is present the programmer could decide to offer the user a full 24-bit graduated colour sky, and perhaps yield the same performance as the flat colour alternative with no MMX.

The programmer has the choice of inspecting the `CPUID` bit at run-time or install time. On balance, run-time seems the better option, to avoid the situation where a user buys an MMX-equipped CPU to upgrade performance but then wonders why nothing happens because the MMX code was never installed...

MMX technology is targeted at routines that are compute-intensive and whose speed is critical to the application as a whole. Generally, routines such as these are hand-coded in assembler. High-level language support will nevertheless be available, Microsoft has made a commitment to releasing a version of Visual C++ with MMX support.

The advent of new instructions to the Intel x86 architecture is quite an exciting time for programmers and users alike. The expected performance benefits can result in faster video, better graphics, and much lower processor overhead when handling both visual and audio material. The challenge to programmers is not simply to speed up their applications, but to identify those areas where the higher performance of MMX technology allows them to offer the user additional features and functionality. ■

Andrew Ward is a freelance journalist with programming experience ranging from writing device drivers to developing applications in Basic, VB and C. He can be reached at andrewward@cix.compulink.co.uk.

For more information on MMX check Intel's special MMX page at http://www.intel.com/pc-supp/multimed/mmx/.

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Californian stand-off

C, C++ and solutions were what **Francis Glassborow** expected to find in sunny California. He was in for a surprise.

The recent joint meeting of X3J16/WG21 (responsible for drafting the C++ standard) in Santa Cruz was the most tense for several years. Throughout the week a Sword of Damocles hung over our heads. Persuading those with the power to snip the thread to leave it hanging for another four months consumed quite a few hours. An issue which can bring such committees so close to self-destruction is clearly an important one. Though many issues were cleared up and much constructive work was done during the week I am going to focus on the unresolved problem.

Expectations

Ever since the publication of *The Annotated C++ Reference Manual* in 1990, C++ programmers have expected that templates would be separately compilable. Unfortunately, many have assumed that this would be similar to the separate compilation of normal source code. A little reflection will convince you that this could not have worked. The only context needed for compilation of an ordinary source code file, without any template instances, is that provided by included header files. Code compiled at remote locations can be brought together and linked to produce an executable. The adoption of coding styles that capitalise on this facility is one of the hallmarks of C/C++ professionalism.

The introduction of templates dramatically changes the situation. Somehow your development tools have to generate specific code to instantiate the required instance of a template in the context of its use. There are two main ways in which this might be achieved: to generate the code at the point of instantiation or to make code generation a separate activity.

In order for the second of these to work, information about the context of the point of instantiation, ie information about the file using the instance and all its dependencies, must be made available at the point where code is being generated. There are many ways in which this can be done, however compiler implementers currently have severe reservations about their ability to provide this route efficiently enough (or even at all) to make it attractive to users.

The first option seems easier but requires that the template code (rather than just the declarations) be available at the point of instantiation. Then the compiler can generate the source code in situ and compile it. All popular compilers use this method. It suffers from a very serious limitation: the programmer cannot separate the interface (header file) from the implementation of a template. Do not get misled, users of templates will always need access to template source code in a way that is not necessary for non-template source. You cannot have a library of compiled templates analogous to ordinary libraries. Vendors of template libraries will need to distribute source code (encrypted or shrouded if they wish).

Many of you who have become familiar with using templates may wonder what the problem is with this approach, ie making template source visible at the point of instantiation/use. Consider:

```
file1.h
int f (char);      //some function declaration
template <typename T>
int g (T t) {
  return f(static_cast<char>t);
}

file2.cpp
#include "file1.h"
#include <iostream.h>
int f(double);    //declaration of a user's function
int main (){
  cout << f(1); // line A
  cout << g(1.0);
  return 0;
}
```

This example's purpose is only to highlight the problem. Without the inclusion of `file1.h`, `f(1)` in line A binds to the user-written `f(double)`, but once `file1.h` has been included it will bind to the template provider's `f(char)` as this will be a better choice under the rules for overload resolution. When including the template definitions as well as the declarations, all the declarations which the template code relies on must also be included. This changes the context of the user-written file. This problem can be fixed by careful use of namespaces (interestingly, this was not the reason that namespace was introduced into C++).

Unfortunately, there is a much worse problem waiting to bite. Standard C header files may contain `#define`s for lower case identifiers. For example `strlen()` in `string.h` may be a macro. In a similar fashion you may find other peculiarities in user-written header files. As soon as any such header file has been included, even indirectly (nested), your code is vulnerable. The `namespace` facility will not help because preprocessor directives have no regard for scope. For this reason we want to minimise promulgating `#define` directives via nested `#include` directives.

The above strongly suggests to separating the point of code generation from the point of instantiation. We do not want to include anything other than the necessary declarations into our code. So we want to rewrite the above simplistic example as is shown at the top of the next page.

This simple case should cause no problem. However note that we now have some subtle dependencies brought about by the order in which header files are included in `file2.cpp`. `#define` directives are still a menace, and the exact location of declarations must be handled correctly. In real code with many templates, some taking templates as their template parameters (quite a common phenomenon in the Standard Template Library) we are very vulnerable. Worse still, many compiler implementers are uncertain of their ability to provide a compiler

```
file1.cpp
int f(char);     //some function declaration
template <typename T>
int g(T t) {
  return f(static_cast<char>t);
}

file1.h
template <typename #T>
int g(T t);

file2.cpp
#include "file1.h"
#include <iostream.h>
int f(double);   //declaration of a user's function
int main(){
  cout << f(1);  // line A
  cout << g(1.0);
  return 0;
}
```

that can resolve all the issues in a sensible time. We simply do not have any experience of this kind of implementation.

Design versus implementation

Currently, the C++ Working Paper requires implementers to support both mechanisms. Strictly speaking it only requires support for 'separate template compilation' as the user can force the semantic effect of the other. The problem at the meeting was that many of the compiler implementers had banded together to support a motion to remove the requirement for support for 'separate template compilation'. The language designers were near apoplectic at what they viewed as emasculation of the C++ template compilation model.

Some of us could see that the push for a decision was badly timed. There are still a number of technical issues that need to be resolved to get the more advanced features of templates to work reliably (indeed, there are substantial parts of the standard library that cannot be compiled by any existing compiler – worth remembering when you see vendors make claims for their implementations of the C++ Standard Library). It seems possible that the necessary technical work to fix this may result in solutions which convince compiler implementers that the 'dragons' lurking in 'separate template compilation' are no worse than those in 'include all template compilation'.

The upshot of hours of peace brokering was that X3J16 passed (by a majority of 3 to 1) a motion to remove the requirement for support for 'separate template compilation' followed by a motion to reconsider (passed without descent) that was tabled till the next meeting which will happen in Stokholm in July.

We have a four month stay of execution in which to persuade one side or the other that 'separate template compilation' is or is not technically viable. Clearly with such a major issue on the table, the planned vote on registering the Working Paper for a second Committee Draft ballot could not go ahead and has been postponed till July.

Last month's problem

What should you write as the first three lines of a compare function to be passed to `qsort()`?

I have to admit that I am horrified by the number of times I see programmers, who believe they are competent, start with:

```
int compare(const T* t1, const T* t2)
```

Then they put their compiler warning to sleep with by using `int()(const void *, const void *) compare` in the call to `qsort()`. Surely such a blatant information hiding cast must be wrong. `qsort()` will be passing the addresses of the data elements as `void*`, these need not be either the same size or the same layout as `T*`. It is perfectly possible that `sizeof(void*) != sizeof(T*)`. Even though this may seem unlikely, why take the risk?

Think of all the other errors that you may hide by using such a cast. For example, suppose you carelessly declare your comparison function as:

```
int compare (T t1, T t2);
```

Any necessary casts should be made as late as possible. You know that `qsort()` is going to pass the addresses of elements as `const void*` and your code should reflect this knowledge.

```
int compare (const void * v1, const void * v2) {
   const T * t1 = (const T*) v1;
   const T * t2 = (const T*) v2;
// rest of code
}
```

One thing that C guarantees is that casting a pointer to a `void*` and then back to its original type will reproduce the original value. With our function written this way, the compiler will generate `void*` pointers to the data that we are sorting, which we then explicitly cast back to what we know they are. If we use the wrong comparison function for the array we are sorting we may still get silly behaviour but neither style will protect against incompetence.

Sadly, many books present sorting strings using `strcmp()` as an example of using `qsort()`. This works because C specifically requires compatibility for `void*` and `char*` (which carries the requirement that `char*` shall have sufficient capacity to represent all other object pointers). I wonder how many technical reviewers notice such instances of poorly chosen examples that must work but that cannot be safely generalised.

This month's problems

What should you consider when using `qsort()` in a C++ program? Think carefully as this is far from being a trivial question.

```
/* various included headers */
enum BOOL (FALSE, TRUE);
int main() {
  cout << 0>1 ? FALSE : TRUE;
  return 0;
}
```

This month's code problem contains one unlikely element and one very subtle defect. Most of you should get the first but many of you will even want to deny that there is a second.

If you want to respond directly to me, I am happy to receive email at *francis@robinton.demon.co.uk*. ■

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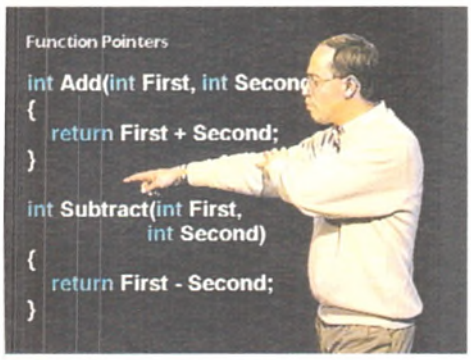

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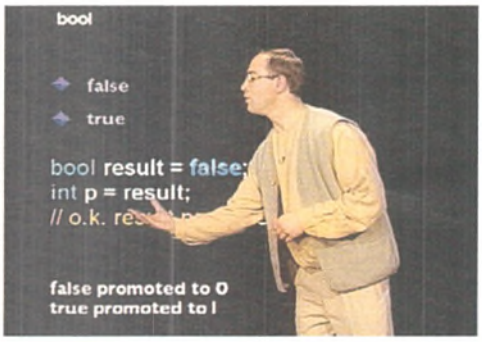

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CIRCLE NO. 625

Borland C++ Development Suite 5.0

Borland's new 32-bit version of C++ is more than just a compiler. **Dave Jewell** reviews this multi-talented development

For the last few months, Borland has created a confusing situation for BC++ users. We started off with C++ 4.5 which was then upgraded to 4.51, 4.52 and eventually to 4.53. The only way of getting 4.53 (according to Borland) was to get hold of a copy of the 16-bit CodeGuard diagnostic utility which comes with the necessary files to patch 4.5x up to the level of 4.53. This, despite the fact that the online CodeGuard documentation specifically tells you to replace the patched version of 4.53 with a genuine version of 4.53 as soon as possible. Small wonder that people got confused.

Well, the dust has finally settled and Borland has now released a major new version, Borland C++ Development Suite 5.0. Why 'Suite'? Well, it includes not only the C++ development system itself, but also CodeGuard (the 16-bit and a new 32-bit version), the PVCS Version Manager, InstallShield Express (the same stripped-down version of InstallShield which ships with Delphi 2.0) and new Java development tools. On my PC, installing the whole lot consumed around 200 MB of disk space. A 'non-suite' version of Borland C++ 5.0 is available.

What's new in Borland C++ 5.0?

At the heart of the Development Suite is Borland C++ 5.0 itself (see Figure 1). The Borland IDE (Integrated Development Environment) runs only under Windows 95 or NT and is capable of creating 32-bit executables for either platform. It can also create 16-bit Windows executables and will even (gasp!) still produce DOS executables for those who want to write them. When Borland C++ 4.0 first appeared, I (along with many others) bemoaned the disappearance of Borland's excellent DOS-based IDE, but it has to be admitted that the age of the DOS IDE is now over. What's not so clear is whether the old PowerPack for DOS will work with version 5.0 or whether a new version is in the offing. (PowerPack is the add-on which allowed version 4.x to create protected mode 16/32-bit DOS executables and DLLs which executed using Borland's DPMI-based DOS extender technology.)

This one-stop approach to program development continues to offer advantages over the competing Visual C++ 4.0 system which targets 32-bit platforms only. Yes, you can use the old 16-bit Visual C++ compiler, but it's far more convenient being able to do everything from one environment. Borland has put a lot of emphasis on the much improved customisation capabilities of the new IDE. This is achieved through a new, programmable 'ObjectScripting' system – more on that later.

Borland C++ continues to be the only system which lets you use 32-bit *and* 16-bit VBX controls from inside your 32-bit application. It supports level 2 and level 3 VBX controls. This is a tremendous plus point for those developers whose existing 16-bit applications are heavily dependent on proprietary VBX components.

ObjectScripting

You may recall that some years ago, Borland purchased the rights to the popular Brief programmer's editor and subsequently resold this product under its own name. Ever since that time, it's been anticipated that a future version of Borland's development tools would incorporate the same, C-like macro language which made Brief such an incredibly versatile tool. Well, it looks like this is it.

Rather than talking about macros, Borland refer to 'cScript' as a 'scripting' language. Using cScript, you've got access to the same low-level primitives that the Borland developers used when putting the IDE together. Unlike Brief, which employed a separate macro compiler to pre-process macro source code, a cScript script is transparently compiled into p-code when first loaded into memory and is then directly executed by the interpreter built into the 5.0 IDE. A script source file has an extension of .SPP and a compiled script has an extension of .SPX.

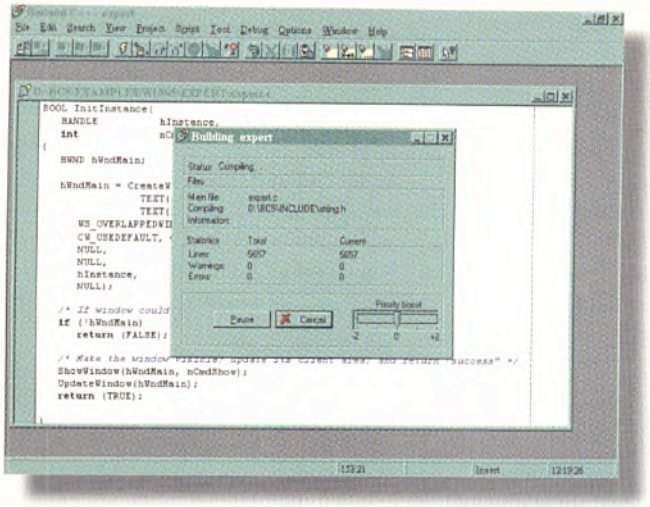

Figure 1 – The new compiler has a priority 'boost' control for improving compilation speed at the expense of other applications. You can temporarily pause a compilation.

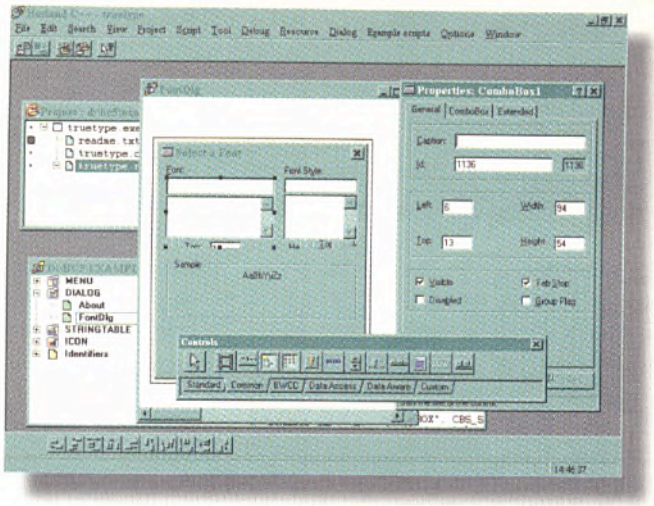

Figure 2 – Borland C++ 5.0 sports fully integrated resource editing along with a very Delphi-like component palette which includes the Windows 95 common controls and data-aware components.

The development environment itself is extremely customisable. Every user command is tied directly to a specific script. You can modify these as much as you like to provide your own, uniquely customised system. In addition, there's a whole menu devoted to an array of other example scripts which are designed to show the power of the scripting system. For instance, try typing `get` in your source file and then – taking care to leave the insertion point where it is – select 'API expander' from the menu of example scripts. This will pop-up a list box of all the run-time library calls whose names begin with `get`. I selected `getcwd` whereupon the script completed the function name in the source window, added the type declarations for the needed parameters and politely reminded me that I needed to include the `DIR.H` header file before using the function – cute! There's even a script to fire up Netscape and connect you to one of the Borland Web pages.

The most important thing to bear in mind is that these scripts aren't applicable only to the editor. The script language provides interfaces to the IDE, the menu system, the debugger and even the script engine itself. cScript is object oriented and – like C++ – is based around the concept of classes. It's definitely not a toy language – you can make calls to DLLs (including, of course, the Windows API itself), and you can control other applications via OLE Automation. Let's just hope that it does prove to be a major productivity aid – I have visions of scores of programmers spending their time tweaking the development environment into their personal vision of Nirvana rather than getting on with the job in hand!

Scripting aside, the IDE can be customised on another level via a set of OLE interfaces, source for which is included with the compiler. The integrated resource editor, debugger, AppExpert and ClassExpert all make use of these interfaces. One thing that's very clear – Borland certainly practices what it preaches. The IDE and development tools are all written in C++ and make extensive use of the OWL framework.

Integrated resource editing

Like Visual C++, resource editing is now fully integrated into the development environment. Clicking on the name of a resource script file in the project window opens up a tree-structured view of all the resources in your project. You can then click on a specific resource to bring up the editor for that resource type. The dialog box editor is particularly noteworthy – it provides full support for the new Windows 95 common controls (see Figure 2). Borland has done a more complete job here than it did with Delphi 2.0; the animation and toolbar controls, both conspicuous by their absence in the Delphi Component Palette, are there. Speaking of which, the dialog editor now sports a very Delphi-like tabbed palette from which you can select Visual Database Tools controls, common controls, any OCX and VBX controls you have installed and so forth.

Although the integrated resource editing is certainly convenient, I can't help feeling that the Resource Workshop, which was a perfectly good utility has been needlessly sacrificed. It would be nice to think that it was still under development.

The new VDBT (Visual Database Tools) are based around the same 16/32-bit Borland Database Engine used by Delphi. As with the Delphi system, it's possible to build a great-looking database application without writing a single line of code. By dropping a number of components onto a form and connecting them together using their various properties it all just happens. Again, as with Delphi, the database controls allow you to see live data even while you are putting together a form in the IDE.

Debugging capabilities

The IDE's integrated debugger has been much improved. Those of us who spend a lot of time doing system-level programming tend to regard integrated debuggers as inferior. Part of the reason for this is the fact that you can't usually get a CPU view. If I can't see what machine code the CPU is executing, the state of the flag registers, etc., then I feel as if I'm debugging in the dark. Obviously, you don't need this level of detail in day to day application development, but when you're executing some DLL routine with the wrong calling convention, tracing through a bit of in-line assembler code or even find yourself in the middle of a compiler code-generation bug (yes, it has been known!) it's very important to be able to see what's *really* going on.

Thankfully, the integrated debugger now supports a full CPU view (see Figure 3). The debugger provides full support for multi-thread and multi-process (on NT only) debugging. You can step right into an API call and return to your program source code whenever Windows executes an application-supplied call-back routine such as one of the `EnumXXXX` call-backs or one of your window procedures.

While on the subject of debugging, it's worth pointing out that the 32-bit stand-alone debugger (Turbo Debugger for Windows) supplied with BC++ 5.0 will work perfectly happily with Delphi 2.0 applications. These tools come 'for free' with Borland C++ (but not with Delphi).

OWL 5.0

As mentioned earlier, Borland is an OWL devotee itself and used it extensively in the development of BC++ 5.0. It's not surprising, therefore, to see lots of new goodies in the latest incarnation of this popular library.

By way of stressing its emphasis on multi-platform support, Borland has gone to some remarkable lengths. For example, if you base your 32-bit program around the new OWL 5.0 application framework, and then recompile the program as a 16-bit application targeted at Windows 3.1, the 16-bit version of the OWL library will directly emulate the Windows 95 common controls under Windows 3.1! This is a big bonus for developers who would otherwise have to choose between plain-looking applications and non-portable ones.

There are lots of other new goodies too. There's a set of classes which provide OOP-based access to the Windows registry, dockable toolbar classes and another class which provides an easy-to-use implementation of an application splash screen. There are classes for providing splitter windows, support for 'recent files' pick lists, and even an encapsulation of the WinG Game API. Another interesting class provides a 'wrapper' for making DLL calls where you suspect that the DLL might not exist. This is used internally by OWL when communicating with the Windows common controls. If the wanted API isn't found then an exception is raised which – in the case of the 16-bit library – causes OWL to provide the necessary emulation support itself.

OWL has been written so that it can be used on non-Borland compilers; it relies only on standard language features. However, for those who prefer to use MFC, Borland has made some changes to the compiler which improve compatibility with Microsoft's class library. This is now the only major development system which doesn't come with a licensed version of MFC. It's been reported that Microsoft refused to license the application framework to Borland unless it agreed to drop the competing (and arguably much superior) OWL library. Well, *you* might think that sounds like typical Microsoft behaviour; I couldn't possibly comment...

What I can comment on is the improved MFC support provided by the new Borland compiler. Borland lists ten different language 'adjustments' which become active while MFC compilation support is enabled. In addition, the Borland compiler makes a minor patch to the MFC source code which makes it more compatible with ANSI/ISO C++. This patch is backwards-compatible with Visual C++ so all your code will still work with the Microsoft compiler. To quote a rather barbed comment from Borland, '*MFC makes use of "bool" as a variable, while the ANSI/ISO committees state that it is a type. It is rather difficult to get a compiler to understand one word as both a type and a variable...*'

Language enhancements

Borland C++ has supported templates, exceptions and RTTI for some years, but the compiler now includes support for namespaces as well. Additionally, the new C++ keywords `mutable`, `explicit`, `typename` and `bool` (see comments on MFC earlier) are supported and the package includes a copy of the coveted Standard Template Library (STL).

There's support for a complete set of alternative operators which replace the standard C++ operators on non-US keyboards which don't have `&`, `^`, `|` and other keystrokes. You may recall that way back in 1987/8 the ANSI standards committee tried to solve this problem by using so-called trigraphs. All it really *did* was to reduce any source code to meaningless hieroglyphics! As an example, consider the following:

```
// Standard C without trigraphs
if (bDone || bAbort) SignalEnd ();
// With trigraphs - yuck, yuck, yuck!
if (bDone ??!??! bAbort) SignalEnd ();
```

With the new keywords, this can be replaced by:

```
if (bDone or bAbort) SignalEnd ();
```

In addition to `or`, you also get `and`, `not`, `not_eq`, `bitand`, `and_eq`, `bitor`, `or_eq`, `xor`, `xor_eq`, and `comp`. All pretty obvious, really. Since Borland C++ uses exactly the same parser for 16-bit and 32-bit applications, these language extensions are always available and don't limit portability between Win16 and Win32.

There are new code optimisation switches and there's an alternative Intel-supplied back-end code generator which (like the famed Watcom optimiser) is capa-

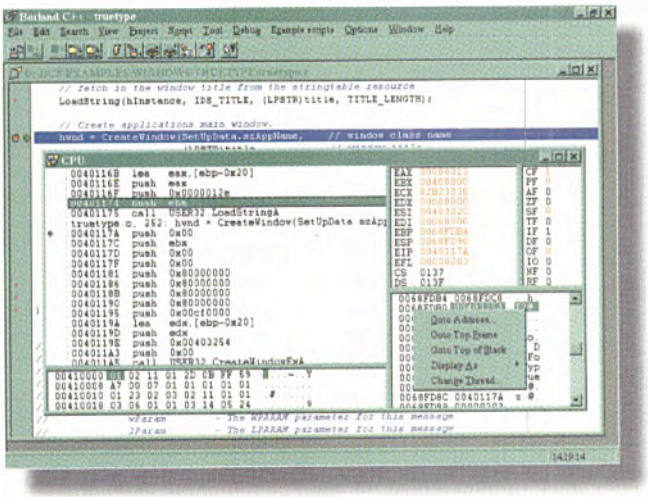

Figure 3 – The integrated debugger sports a CPU view window showing machine code instructions, processor registers, the stack and more...

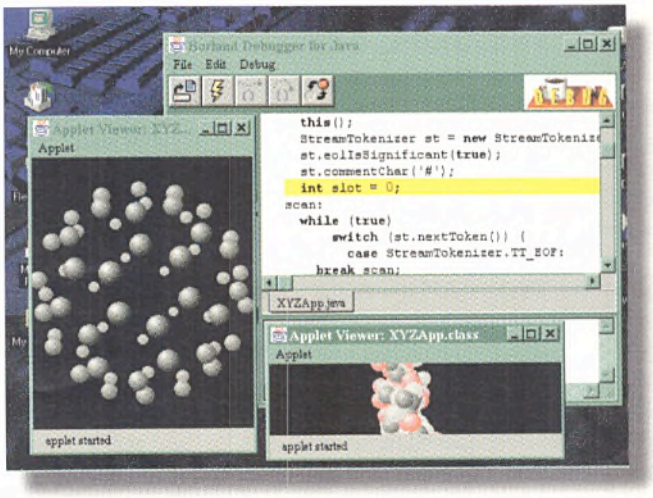

Figure 4 – Although the Java debugger is crude in comparison to native C++ debugging, it's a pretty impressive utility when you realise that it is entirely written in Java itself.

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ble of optimising across function boundaries and supports Pentium Pro code generation.

Even the 16-bit linker has had a bit of work done on it. Borland has finally added the ability to 'chain' fix-ups in an executable file, something that I told them needed doing at least three or four years ago. Microsoft's development tools have done fix-up chaining for quite some time – it's a technique that improves executable load time and can significantly reduce the size of your executable file.

But what about Java...?

One of the most interesting capabilities of Borland C++ 5.0 is the built-in support for Java development. As you'll probably appreciate, Java is a sort of stripped-down C++ subset which allows developers to create platform-independent applications which can be deployed over the Web and executed via a run-time module on each workstation.

The Development Suite includes full support for Java program development including a visual debugger and AppAccelerator, a just-in-time compiler which hooks into the Java interpreter and which is claimed to run your application up to ten times faster than it would do if using the conventional interpreted-only run-time approach.

When you create a new Java project, the TargetExpert asks you if you want to run the AppExpert for Java. This Expert is itself written in Java and is an interesting example of what can be done. Even more impressive is the Java debugger which is written in Java (see Figure 4). In fact, Borland has stated that it plans to create an entire Java development system – written in Java. It will form the core of a powerful cross-platform development tool.

Quite a number of example Java programs are included with the package and – if you have Netscape or another Web browser installed – there are links in the online documentation which take you to other Java sites and the Web-based Java reference manual itself.

On the negative side, the Java side of things gives every impression of having been hastily bolted onto the product. There is not a word about it in the printed documentation which accompanies the Development Suite. When I tried out some of the sample Java applications, it was a while before I discovered that to run something you had to right-click on a HTML node within the project window and then select JavaView from the resulting pop-up menu! Even less obvious was how you debugged a Java application: the online documentation was simply not adequate. I also noticed that for every executing Java application (including the debugger and the Java AppExpert), the system created an empty MS-DOS window which appeared to sit there doing nothing; maybe the Java runtime uses some DOS-based component. Be that as it may, I was quite impressed with the sample applications and with the capabilities of the Java language to which I hadn't previously had much exposure.

InstallShield Express

As mentioned previously, Borland C++ 5.0 Development Suite comes with a number of other goodies including the PVCS Version Manager and a new, 32-bit version of CodeGuard, but most developers will be especially interested in the new Borland C++ version of InstallShield Express. Although the 'Express' versions of InstallShield (there's one for Delphi and one that comes with Visual C++) don't have the functionality of the full product, they're nevertheless very capable installer packages, with the emphasis on ease of use.

As you can see in Figure 5, the user interface is organised as a checklist of tasks which have to be completed – not all the various steps are essential. Each step expands out into a tabbed property dialog which asks you a number of questions about the sort of

installation you want such as default directory, background bitmaps, what executables are to be installed and so forth.

InstallShield comes in a number of development system specific flavours because each variation has installation capabilities unique to that development environment. For example, the Borland C++ version is capable of installing the Borland Database Engine, ReportSmith, the Local Interbase Server and whatever Visual Database Tools might be required by your program. You don't have to figure out how to install these items yourself – just tell InstallShield what you want and let it take care of it.

A worthy successor

A number of people have reported that Borland C++ 5.0 is quite a bit more resource and memory hungry than it's predecessors. Undoubtedly, there's some truth in that – the remarkable flexibility of the new IDE

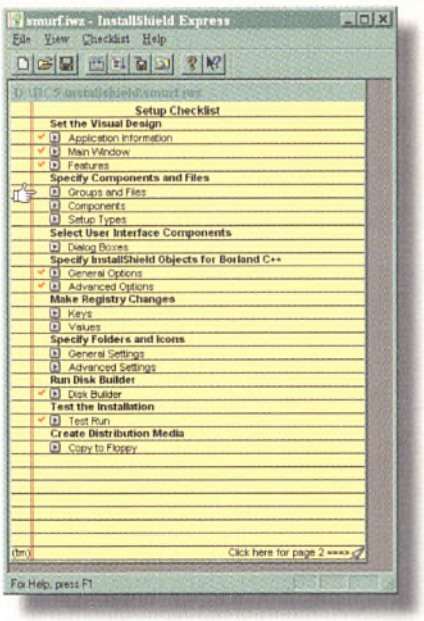

Figure 5 –InstallShield Express has an intuitive, checklist-style user interface and makes it easy to automate installation of the many ancillary components associated with BC++ applications.

doesn't come without paying a price and the modular, OLE and DLL-based approach which Borland has taken towards the development system also contributes towards sluggish performance on middle-of-the-road hardware. I'd suggest that you should upgrade your hardware to *at least* a 90 MHz Pentium with 16 MB of RAM (and preferably more). That said, it all seemed pretty zippy to me, on my nice shiny new 200 MHz Pentium Pro system!

My overall impression is that Borland C++ is a worthy successor to its illustrious predecessors. There's a heavy emphasis on portability between 16/32-bit systems, the Java development tools will give you a head start in deploying applications via the Web, and the IDE is customisable to such an extent that you'll be able to spend many happy hours customising it to suit the way you work without getting anything constructive done at all! Such is the price of progress... ■

Dave Jewell is a freelance consultant, programmer and technical author currently working on a new Delphi programming book. You can contact him as djewell@cix.compulink.co.uk, 102354,1572 on CompuServe or DSJewell@aol.com. *Borland's Estimated Street Price for the standalone BC++ 5.0 is £225 (upgrade from previous version £119), and £315 (upgrade from previous version £179) for the BC++ 5.0 Developer Suite. The upgrade prices are valid until 30th June.*

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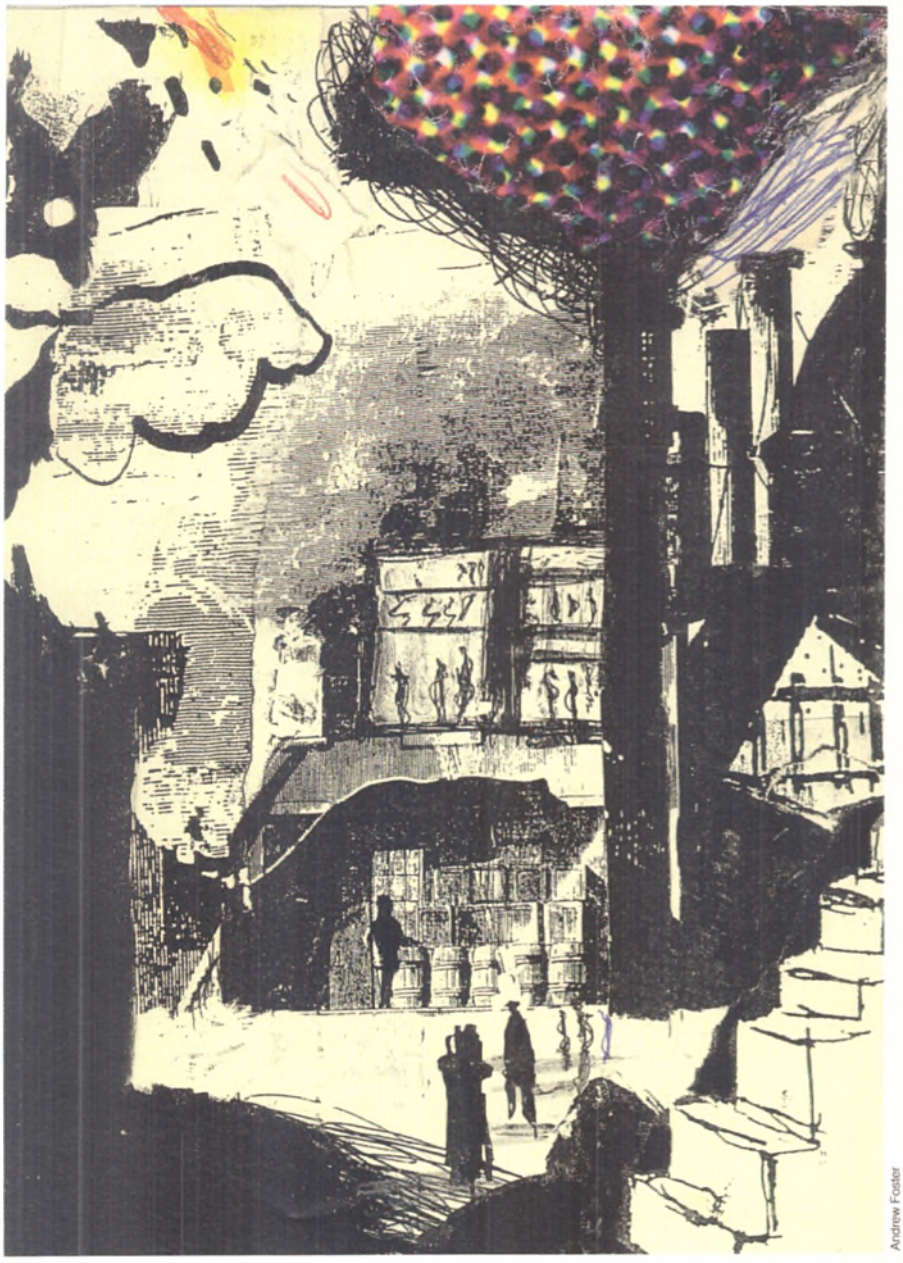
CIRCLE NO. 627

Visual Java?

Rogue Wave has won the race to release the first visual Java development tool; but does JFactory live up to the claims made for it? **Neil Hewitt** finds out.



Andrew Foster

Unless you've been living in a cave for the last year you can't have failed to notice that Java is about the biggest thing in software development right now. Nor is it any secret that the 'official' Sun JDK (Java Development Kit) tools are both slow and unfriendly. The JDK lacks any kind of visual interface builder, and the compiler crawls along even with very small projects. Trying to construct a simple dialog or a form with just a text editor is rather like driving a long distance in a C5 – you get there in the end but it takes forever. Rogue Wave's JFactory has been designed to bridge that particular gap and is claimed to be the first visual Java development tool. In fact it might better be described as a visual interface builder and front-end to the JDK, as JFactory does not include any compilation, debugging, or viewing tools of its own.

The design stage

For an expensive piece of software (£636 per single license), JFactory is remarkably compact, coming on only two high-density floppy disks. Documentation is entirely on-line, and as you might expect from a two-disk package, does not cover the Java language itself, merely the operation of the program. More importantly, the JDK is not supplied: in order to use JFactory, you'll have to get hold of your own copy of it. It may be that Rogue Wave assumes that developers buying JFactory will already be using Java and should therefore have the kit, but I was disappointed to find it missing. For JFactory to be truly as revolutionary as its creators suggest, it would need to be a one-stop Java solution. In this release, at least, it isn't.

JFactory allows you to build two different kinds of Java program; these are rather catchily termed 'Applet' and 'App'. 'Applet' is the standard term for small, downloadable Java programs which are found in Web pages. An 'App' is a program which creates its own window and dialogs and does not run within a browser. You must designate which type of program a project will be when you create it, although you can change the project type later if you wish. You can still embed an App into a Web page, but when running it will operate in its own window rather than within the browser window.

The software bears an uncanny resemblance to products such as Visual Basic and

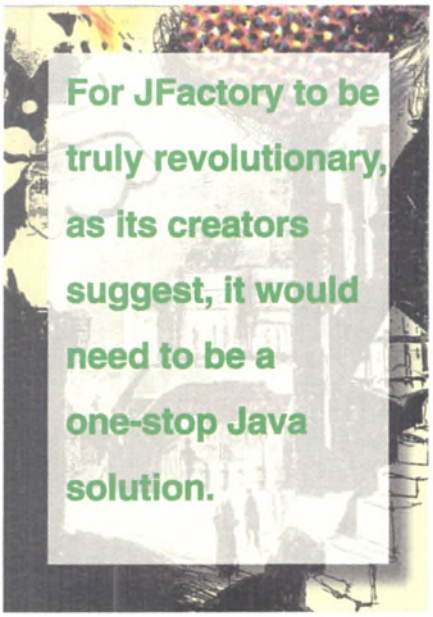
Delphi *(see Figure 1)*. It has many similar elements: a form designer, a palette of tools and components, property sheets and a source code editing window. Forms are designed by selecting a control, then dragging it into place on the blank dialog. You manipulate the properties of a control in the Visual Basic manner; click on an item on the property sheet and JFactory automatically offers you the appropriate choices. The visual interface builder is flexible and reasonably intuitive, and will be familiar to users of Rogue Wave's other products, as JFactory derives from the successful zApp Factory. It provides a wide selection of tools for aligning and manipulating controls to give the best appearance. Unfortunately, due to the limited number of GUI elements supported by Java, you can't spice up your dialogs with tab-bars, spin boxes, or progress bars (at least, not without writing custom Java classes for them). Java has to remain a cross-platform language, after all.

A toolbar contains pushbuttons for almost all the functions of the program, which should indicate that the menus are in fact rather spartan; there's none of the huge array of options we've become accustomed to finding in our modern development environments. The source code editor is restricted to simple search/replace, there's no syntax highlighting, you can't even change the font or point size the editor uses. You can use your own editor, however, and JFactory provides default command lines for the most common add-on editors such as Codewright, Epsilon, and Brief. There are no settings for compiler or make options within the program: the only way to modify the compilation parameters is to edit the command line used to invoke the compiler (and then modify it back again afterwards). Although the Java compiler doesn't have the plethora of options supported by Visual C++ 4.0, for example, there really ought to be some simpler way of setting up special compiler options.

A further complication is that JFactory uses its own proprietary format for project files (as does every other Java development environment on the market) and therefore projects written under it cannot be imported to another package (or vice-versa). This means that you cannot open the samples contained in the JDK as JFactory projects.

Initial assembly

The second page on the property sheet for each interface element deals with events – like handlers in VB. By selecting a particular event you can decide how it should be dealt with; you can link events directly to other windows or dialogs within your program (including the Windows common file open and save dialogs), or specify a link to the source code. In this case, JFactory opens up the source window and positions the cursor ready for you to code the event handler. Of course, the framework code which makes up the majority of the Java program has to come from somewhere, and in fact all this code is automatically generated by JFactory. Unfortunately, this means that every time a change is made to the structure of the project, such as adding or removing a control, or creating a new event handler, the source must be regenerated. This can take quite a while for big applets; even on a Pentium you could find yourself wasting a great deal of time staring at the cheerful 'Generating source...' dialog. The secret to really rapid application development with JFactory appears to be that you should get the interface design finished before you move on to the event handlers. To aid this, there is a test facility which allows you to try out the user interface you have developed without needing to compile the code. This is quite comprehensive, even going so far as to animate Java image loops during the testing process. It's also very quick – quicker by far than using the interminably slow Sun 'Javac' compiler every time you make a change to the interface. The test facility cannot test your actual code, however, and so eventually there is no option but to compile.



Standalone applications can be tested by running them through the Java interpreter program – JFactory will do this for you at the click of a toolbar button – and applets are tested by running them through your Java-enabled browser, or the appletviewer included in the JDK *(see Figure 2)*.

Missing components

A good development system needs a proper graphical debugger, and this is a glaring omission from JFactory. The only debugging tools are those command-line utilities in the JDK. Since both Borland and Symantec

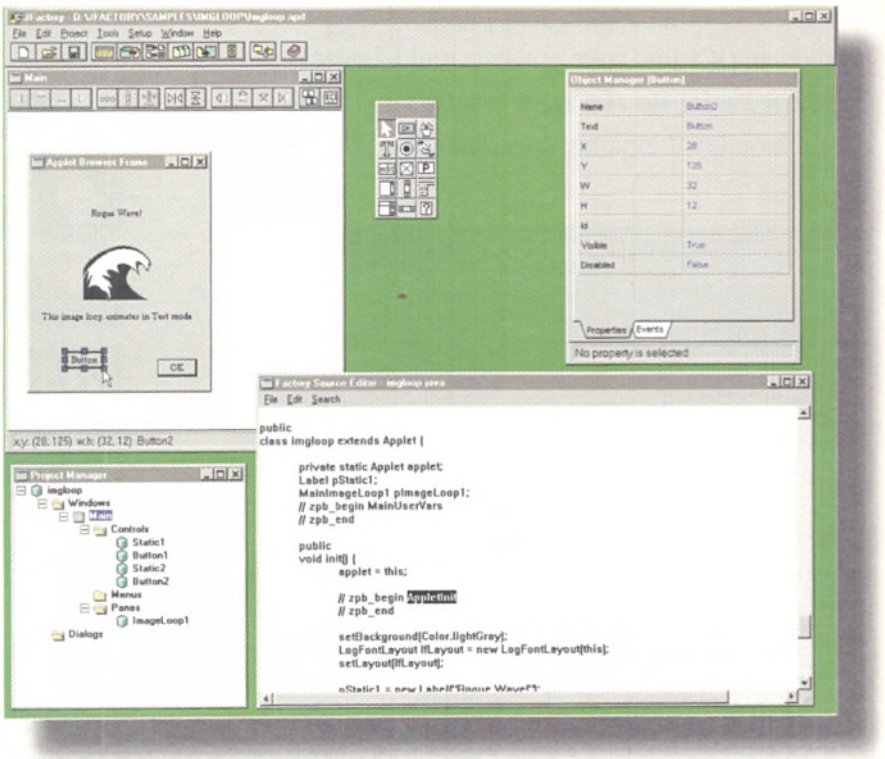


Figure 1 - The JFactory visual interface builder environment

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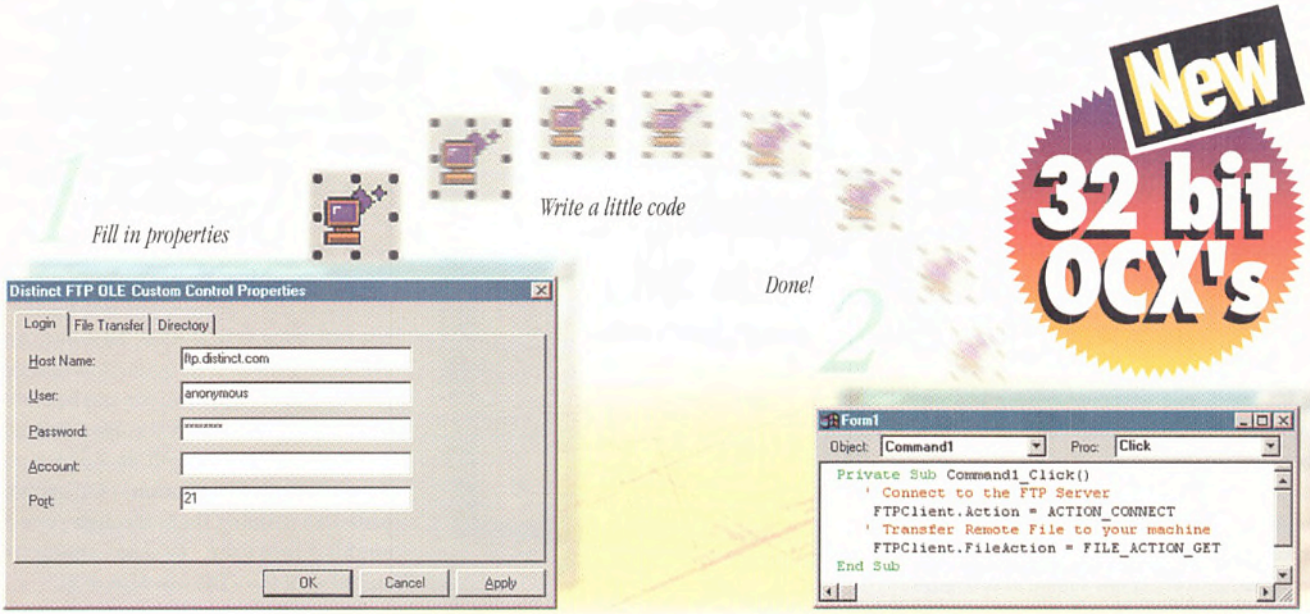

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Compliation versus interpretation

Is Java an interpreted language, or a compiled language? After all, Sun provides a Java compiler *and* a Java interpreter in the JDK. With BASIC or C, the developer is on safer ground: C is compiled, and BASIC is interpreted (except where C is interpreted and BASIC is compiled, which has been known to happen). Java, on the other hand, is compiled *and* interpreted.

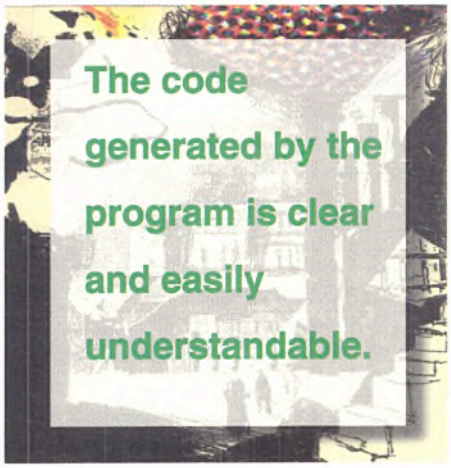
The Java *compiler* produces a byte-code which can be thought of as a cross-platform sort of binary. This byte-code is compact, and optimised for speed during the compilation process. The small size reduces download times and makes it an ideal language for Web-page applets. The Java *interpreter* is a virtual CPU, written seperately for each platform, which executes the byte-code as if it were a real instruction set. Provided that your platform has a Java interpreter (at the moment this is restricted to Windows 95, NT, and sundry flavours of Unix, but Macintosh and OS/2 versions are on the way), Java programs written with the JDK should run right out of the box. Sun has tried to make the virtual instructions translate as often as possible into individual, rather than multiple, real instructions in order to reduce the overhead. Claims that Java programs execute just as quickly as C++ programs should be taken with a pinch of salt, however.

At the moment, no Java tool can take the ultimate step of compiling a Java program into a processor-specific binary format. Some might argue that this goes against the very nature of Java, which is that programs written in it should run on any platform without any alteration, but if Java takes off for writing large applications rather than just applets – and don't forget that Sun's HotJava browser was written entirely in Java – there's bound to be a call for full compilers that implement platform-specific features.

In fact, Borland's Just-In-Time compilation is a step towards this; this feature (also known as the AppAccelerator) keeps a copy of the binary code produced when the byte-code of an applet runs through the Java interpreter, and then runs the binary code. This can speed up execution by a factor of two.

The future of Java may well lie in the half-way house solution, ie applets would be compiled down to a binary format after downloading and remain in a machine's Web cache. If needed again, they could then be executed immediately with maximum speed. If, as some people expect, Web-distributed applications written in Java become commonplace, something will need to be done to address the speed problem – speed of downloading as well as speed of execution. Using this method, the main advantages of Java-written applications over the Net would be preserved. The applications would remain cross-platform, and could be updated and amended without the need to re-install. Changes would simply be downloaded, run through a Java interpreter-compiler, and cached as a binary image.

The real problem, of what label to apply to this new type of language, has yet to be resolved. *Interpiled* and *compreted* don't sound right. And it should be a real word, not just another vague acronym! Let us know what you think on this one.



have seen fit to include graphical, source-level debuggers in their new Java products, Rogue Wave should have considered more carefully before releasing JFactory without one. Equally, both Borland and Symantec include the JDK in their products; in each case, the tools have been tweaked to run more smoothly within their new environment, to the extent where you can hardly tell in Borland C++ 5.0 whether you are compiling a C++ program or a Java applet. When you ask JFactory to compile, it invokes a DOS box and runs the compiler – all very *obviously*. If GUI software is going to make use of command-line tools, it really ought to hide it better (Visual C++ 4.0 being a good example). There's no class browser, either, which for an object-oriented language such as Java is a serious omission; again, one that will not apply to Symantec's Cafe.

On the plus side, JFactory features a Project Manager window, which displays the hierarchy of forms and controls within the project in an Explorer-style expanding tree. This can be useful to keep things in order when you have a large number of dialogs. There is also an Object Library, which contains templates for common types of dialog box and menu bar, speeding up the creation

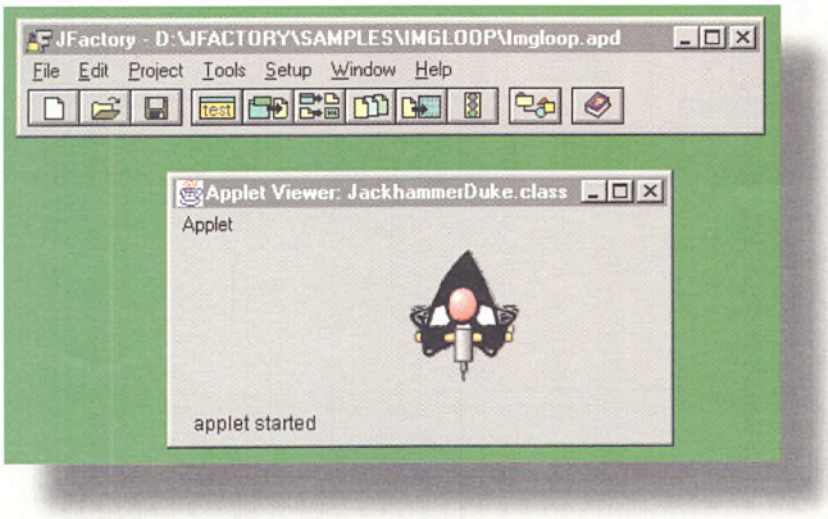


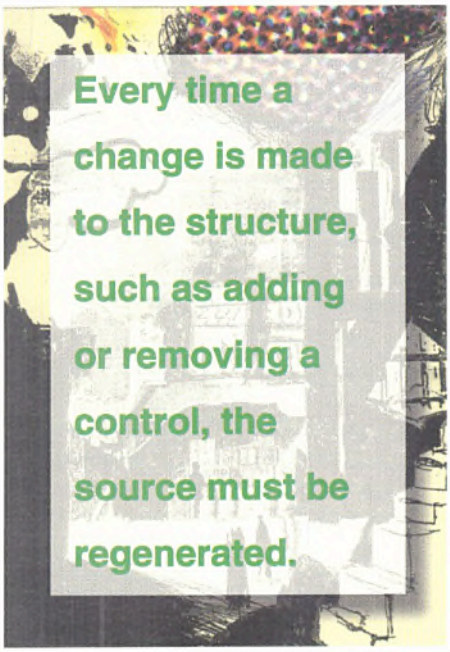
Figure 2 - The appletviewer allows you to test applets without a browser

time *(see Figure 3)*. You can add your own Java classes to this library and re-use them in subsequent projects. How useful a feature you find this would depend on what kind of Java applets you build.

Final assembly

The code generated by the program is clear and easily understandable (which is more than can be said for some C++ code generator systems!), but you must be careful to add your own code only between the markers. If you place code outside them the generator will simply remove it the next time the source is refreshed. This is inconvenient, as it makes hand-optimisation more difficult. Speaking as one of those programmers who still likes to tidy up his code after the MFC Wizard or whatever has finished with it, I am not at all keen on the idea of having to abandon JFactory's nice graphical interface and go back to the command-line just so that I can give my application its final polish.

Code-generating Wizards (or Experts, or whatever you want to call them) are rightly popular in the programming world because they can save you a lot of time and effort; a large proportion of the code in any Windows program is purely for dealing with the interface, and therefore ripe for automatic generation. Java is no different; in an average Java applet there will be reams of code dedicated to setting up classes and responding to events which the programmer will have to spend much of his time writing (and debugging when the inevitable errors creep in). With JFactory, the larger part of this pain is taken away, and the programmer can concentrate on the code that matters – the event handlers. This is the style of programming which made Visual Basic so popular. In fact, the two packages are very similar: both consist of visual interface editors with an interpreted back-end, and both stress (indeed VB enforces) the event-driven model. I didn't feel nearly as comfortable with JFactory as I did with Visual Basic, however, because the divisions in JFactory – between Rogue Wave's GUI code and the Sun JDK code – are all too obvious. It feels more akin to one of the early Windows 'shells' to DOS command-line tools than to a complete visual programming system like VB.



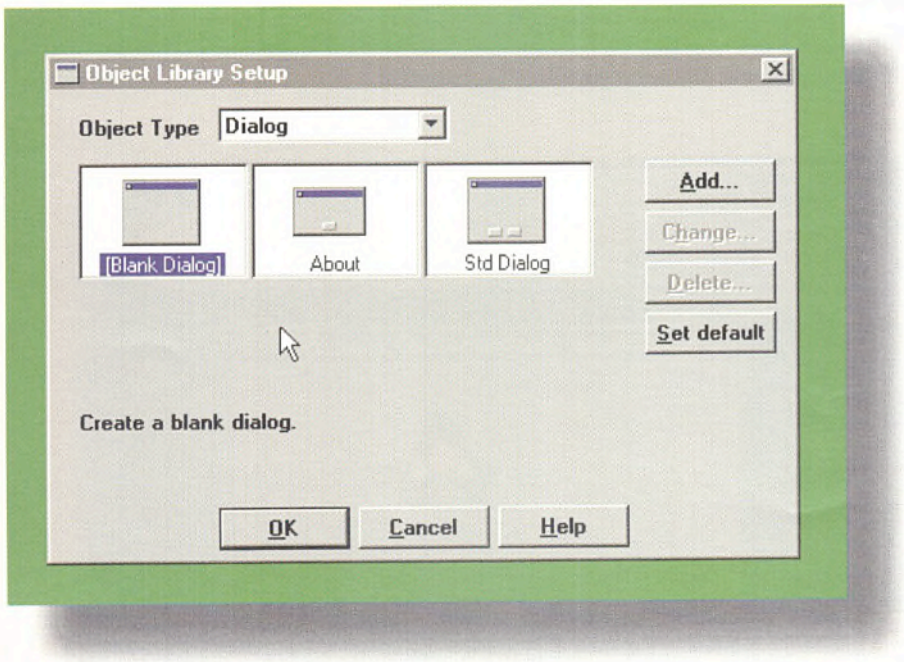


Figure 3 - The ObjectLibrary is a repository for common components

On the test-track

Applets made with JFactory can be run either through your Java-enabled browser locally, or using the JDK appletviewer. Applications can be run through the 'Java' utility, which contains a stand-alone version of the virtual machine. Performance is variable, and depends upon the tasks which the app or applet is called upon to do, but in general I found that applets ran slowly both through the appletviewer and the browser, while applications performed rather better under the Java interpreter. On a Pentium 90 with 32 MB of RAM, the performance was acceptable but not exceptional. On a DX2-66 with 32 MB of RAM, it was dismally slow. It seemed to make no difference whether I ran the applets under Windows 95 or NT.

These speed problems are not directly related to JFactory, of course, but rather to the JDK, where the first-generation tools clearly need greater optimisation. Nonetheless, it does serve to illustrate the point that JFactory can only ever produce applications that are as good as the JDK allows. Version 2.0 of the JDK, when it arrives, will inevitably improve this. Third-party vendors are coming up with their own solutions, such as Borland's Just-In-Time compilation, and Symantec's new improved version of the Java interpreter. This situation will no doubt improve, so you may wish to wait and see what happens.

End of the line

JFactory *does* make it easier to build Java programs. By generating much of the code for you it takes away a large chunk of the effort required, and in its primary role as a visual interface designer it makes it simple to build dialogs and windows for use in your Java creations. As an add-on, JFactory works, but it isn't a complete Java development system, and that is where it falls down. By failing to include a debugger or class browser, and by failing to include standard features such as syntax highlighting which we take for granted in other vendor's development systems, Rogue Wave has missed an opportunity to go beyond the original idea of zApp Factory and create a real rival to the Borland and Symantec products. The final sitcking point is that both alternative products are considerably cheaper.

So, while Rogue Wave has certainly won the race to produce the first visual tool *for* Java, we'll have to keep on looking for the first true Visual Java. ■

JFactory is available for Windows 95, NT, and Solaris, priced £636 for a single user license. Contact Hypersoft Europe on 01273 834555.

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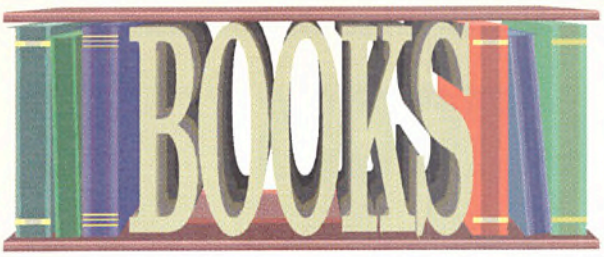
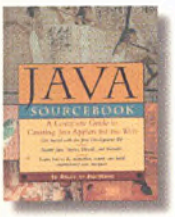


The Java Sourcebook reviewed by **Neil Hewitt**



Billed as a 'Complete Guide to Creating Java Applets for the Web', The Java Sourcebook has a lot to live up to. The good news is that it manages it admirably. Written by Ed Anuff, HotWired's resident Java guru, the book manages to avoid being evangelistic or too conversational, and is written in a clear, but still technically rich style. The first part of the book covers the Java language from the basics: Anuff begins with the basic principles of Java itself, before taking a look at object-orientation, operators and expressions, variables and types, program flow control, threads, and exception handling. He also covers interfaces (Java's workaround for the lack of multiple inheritance) in some depth. There's enough material here to give the novice programmer a good grounding in the basics of OO. That said, I wouldn't recommend that anyone try Java as their first programming language armed with this book alone – better to try C and go from there. The book moves on to discuss the use and creation of Java class libraries, and from there on to the subject of Java applets, which are then covered exclusively.

Later chapters cover the construction of applet user interfaces, including a detailed look at Another Window Toolkit (AWT), with a whole chapter given over to the use of graphics within Java applets – this is, for my money, one of the most useful chapters in the whole book – and the multimedia aspects of applet programming, such as adding sound and animation to Java projects. There is also an entire chapter on the HTML programming necessary to add Java support to your Web pages (although this does not include any detail on the server-side arrangements which need to be made – I suspect this was considered to be outside the scope of the book).

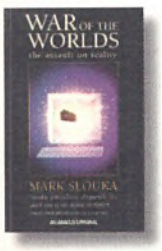
Each subject is illustrated with code listings; fortunately for the reader, Java code tends to be more compact than C++, so there are few multi-page listings, which makes it much easier to read the code as part of the text, rather than as an add-on. To reflect this simplicity there is no included disk or CD. The companion CD has become such a common addition to programming books that its absence seems strange, at first. Then I realised that about the only stuff (apart from code listings) that Anuff could have put on this disk would be the JDK and HotJava – which would pretty quickly be out of date anyway. The extensive appendices at the back cover the packages (Java terminology for class libraries) included with the JDK, listing all their methods and giving a full description for each. If you've tried to work with the on-line documentation in the JDK you'll know just what a godsend this is.

All in all, The Java Sourcebook achieves its aim of being both a tutorial and reference guide. Anyone starting out with Java would probably find that this book alone would be enough to get them on their way.

✓ **Verdict: Recommended**

Title:	*The Java Sourcebook*
Author:	*Ed Anuff*
Publisher:	*John Wiley & Sons*
ISBN:	*0-471-14859-8*
Price:	*£19.99*
Pages:	*496*

War of the Worlds reviewed by **Mary Hope**



While you can still get away with having no views about New Labour you cannot hold your head up if you do not have an opinion about the Internet. To help those of us who incline to sit on the fence there is now an extensive selection of documented opinions. This book is at the 'Internet can rot the soul' end of the spectrum. Recently I read and reviewed *The Future Does Not Compute* (*EXE* March '96) which was in a similar vein. Although they share a concern about the effect of the net, the styles of the two books are very different. *War of the Worlds* is a much easier read and shorter. But it packs a punch and provides a fistful of arguments about why one should be wary of the effects of the digital superhighway. Slouka does not advocate throwing the baby out with the bathwater and ignoring the net. He sums up his view with a quote – 'If you're not part of the steamroller, you're part of the road'. So if you are not involved you may become a victim. You need to have a view and get in there. What is happening is so all pervasive that you cannot shut the door on it. His approach is to examine some of the more extreme claims of the 'net religionists' and the effect of net culture on the individual and society.

While techno-evangelists claim the superiority of VL (virtual life) over RL (real life), Slouka has no doubts about the weaknesses of a cyberspace existence. In the four central chapters he describes the dangers to our sense of identity, our environment, the community and our sense of reality. While the enthusiasts claim that the disembodied experience of MUDs and MOOs is liberating Slouka more convincingly argues that it can fragment the personality. Gender surfing and cybersex are pale imitations of reality.

The book moves from the personal to the political. On the way, the economic arguments are documented. The digital revolution is a big market and depends to a large extent on us adopting an expensive digital world rather than settling for a cheaper version of reality.

As is inevitable in a book sceptical about the claims for the Internet there is a discussion on virtual communities. Slouka neatly sums this up by pointing out that the term virtual community is an oxymoron. There are several versions of the political implications of the digital revolution. The enthusiasts say that one of the great strengths of the Net is that it allows individualism through the uncensored expression of views and thus supports democracy. Slouka is concerned that the advances in image manipulation (eg photographs as well as New Labour) and our continuous blurring of the differences between reality and image mean that we are vulnerable to manipulation. He sees the threat of authoritarianism and information control.

✓ **Verdict: Recommended**

Title:	*War of the Worlds; the assault on reality*
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Publisher:	*Abacus*
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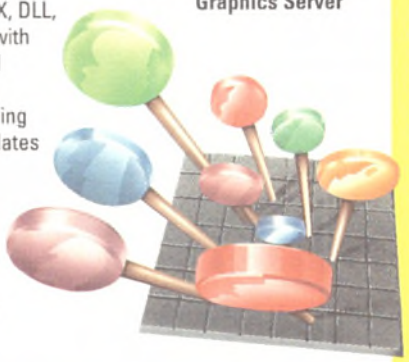

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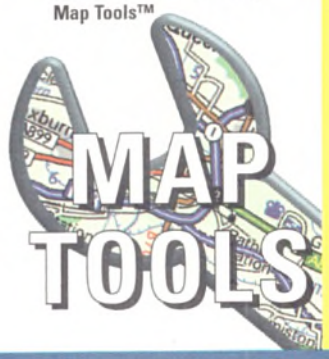

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10% discount on Wizdom pro Application generator!

It is almost unanimously agreed among both industry analysts and practitioners that within the next few years Object Orientation Application Development will and must become the industry standard.

Productivity is the issue. Faced with the reality of budget constraints, ever-increasing user requirements for more and more complex applications in addition to the maintenance burden, MIS executives are looking to technology for the answer.

Object orientation technology is the 'silver bullet' which the industry is counting on to increase application development productivity by at least an 'order of magnitude'.

The problem is that there has been a total lack of user friendly tools for the development of user applications which comply with the object orientation model.

Although most of today's fourth generation languages (4GLs) claim to have various object orientated capabilities (ie relating to GUI), the simple fact is that none of these products have the facilities required to define an end user application in terms of the object orientated model. All currently available 4GLs are visual, user friendly extensions of conventional programming design and implementation concepts.

To date true object orientated user applications have been written in specialised lower level third generation languages such as C++. The use of these languages is time consuming, requires specialised (ie costly) programming personnel, and is often cumbersome.

For more information and to claim your 10% discount in May, contact Hayley Jackson on 0121 323 3433. Offer valid throughout May.

Win a copy of the Java Sourcebook

Java has grown substantially in complexity since it first hit the streets. Now, at last, here is a book that will turn you into a Java programmer, no matter where you are in your level of programming, even if you have never done object-orienting programming before. (See review on page 66.)

This comprehensive guide explains how to install the Java Development Kit, reviews all Java commands and syntax, and directs you to all of the latest online resources for Java users and programmers.

To win a copy of this valuable guide, send us your comments on EXE since you started reading it. The best article will be published and the winner will be invited to our forthcoming 10th birthday party! All entries to the above address please, to reach us by 10th June. Good luck! *Information supplied by the publishers*

Competition Winners - March Issue

Movie Machine Pro: Alex Dunne, Surrey

Crossword: Christine Grover, Essex

ADVERTISERS INDEX

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JOB
'C'/C++ UNIX DEVELOPER

LOCATION	SALARY
Berks	To £23K

A rapidly expanding supplier of EIS solutions is now investing in new development products targeted at the UNIX and 32bit Windows platforms. Suitable candidates must be educated to degree level and have in excess of one year's 'C' and/or C++ under UNIX (HP-UX or SunOS of added interest). Any familiarity with TCP/IP or NFS would be advantageous. Challenging technical work and the opportunity to be part of a highly successful organisation are on offer.

REF: PP/1

JOB
'C'/UNIX/TELECOMMS

LOCATION	SALARY
Cambs	£18K - £25K

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

JOB
'C'/UNIX

LOCATION	SALARY
Home Counties	£18K - £32K

High calibre Software Engineers are required by our client, a leader in Open Systems Technology. Suitable candidates will have at least two years 'C' programming experience in a UNIX environment. Knowledge of UNIX operating system development (kernel, utilities), assembler level programming or compiler writing, although not essential, will be highly desirable. Working in a small, dynamic team, you will be involved in the development of new products and the support of existing products by investigating problems and creating solutions.

REF: LC/3

JOB
'C'/UNIX PROGRAMMERS

LOCATION	SALARY
Cambs	£15K - £25K

Our client is a successful software house, specialising in the development of medical applications. They are currently searching for Programmers with strong 'C' under UNIX skills. Any experience of communications/networking protocols or of Oracle or Sybase would be advantageous, but is not essential. Working in a friendly team, there are excellent opportunities for career progression.

REF: CP/4

JOB
UNIX SYSTEM ADMINISTRATOR

LOCATION	SALARY
City	To £30K

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 working attitude and the ability to react quickly in a fast moving environment is essential.

REF: JK/5

JOB
'C'/C++/UNIX/FINANCE

LOCATION	SALARY
London/Surrey	£20K - £28K

These positions will appeal to candidates interested in developing systems for the trading room environment. Ideally a graduate, you should have strong 'C' and/or UNIX programming skills gained in a financial environment. Additional experience with relational databases (particularly Oracle, Sybase or Powerbuilder) whilst not essential, will be of interest. Working in a challenging development environment, there will be some client contact, so candidates should be articulate, presentable and confident.

REF: JK/6

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- C++ programming experience. there are 2 posts: senior (4+ years) and junior (1+ years)
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Young software engineer with 1-2 years experience who is interested in client/server development. Currently using Borland C++ soon to move to Visual C++ and Visual Basic. Any knowledge of Sequel useful but not essential. this is a good opportunity for a young engineer to pick up some new skills, including PC/networking and relational databases. Ref: KM/612

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South Hants (similar vacancies in Cambs & Wilts)

My client seeks a Software Team Leader to develop bespoke customer solutions and for project development. Ideal applicants will have very good development skills in Visual C++/MFC and ideally some team leadership experience. Ref: KM/614

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Are you a bright software engineer with strong skills in C and/or C++? This is an excellent opportunity to have variety in your work and learn new skills in leading edge technology. Bright grads considered for more junior roles. Call for more details. Ref: KM/603

If you would like more information please call Mrs Kari Myring-McDonald or send your CV with a short covering letter to: Vantage, Acorn House, Midsummer Blvrd, Milton Keynes MK9 3HP Tel: 01908 691400 Fax: 01908 691155

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FRES MEMBER

Ctrl Break

Send your rants and raves and interesting tales to:
EXE Magazine, 50 Poland St
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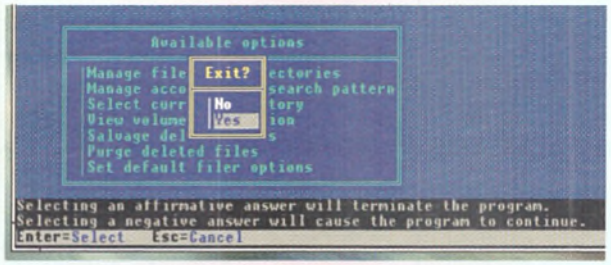
editorial@dotexe.demon.co.uk

A bunch of Mormons?

Former *EXE* Editor Will Watts has contacted Ctrl Brk to ask the striking question, 'Has Novell gone mad?' The software that prompted this query is called FILER, a NetWare 4.1 utility which one uses to do things like failing to recover a swathe of files deleted during a bout of finger trouble. Our screen shot shows FILER with exit confirmation dialog:

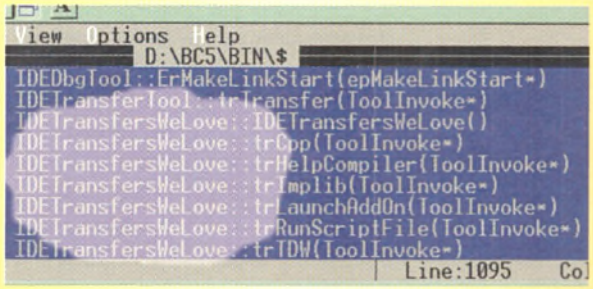


Note that status line: 'Selecting an affirmative answer will terminate the program. Selecting a negative answer will cause the program to continue.'

We suggested to Will that perhaps this was Novell's idea of a joke. 'Don't be ridiculous', he snapped, 'they're based in *Utah*. Everybody knows they are only allowed one joke every 50 years there, and it can't be more than 20 years since Little Jimmy Osmond.'

DLLs in love

When Dave Jewell wrote the review of BC++ 5.0 (see p. 52) he had a look under the hood: 'It's quite fun using the [Borland] TDUMP utility to browse around the supplied DLL's. One thing that's very clear – Borland certainly practices what it preaches'. Does he mean free love?



This screen capture 'is part of a TDUMP listing which shows the callable methods exported by the IDE itself. `TransfersWeLove`? Your guess is as good as mine...' *These excerpts from Dave Jewell are taken 'freely' and without his knowledge! – Ed.*

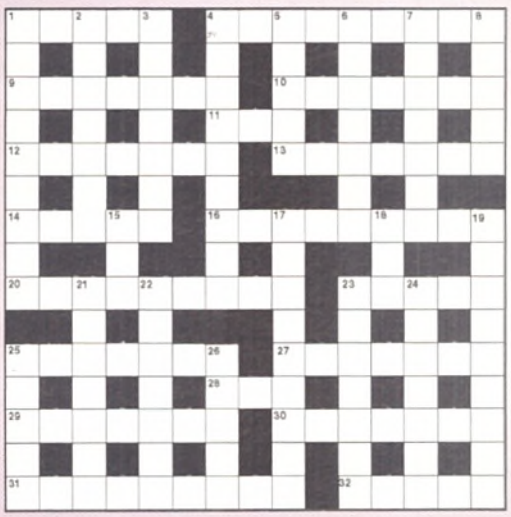
List & Label

List & Label is a report writer library for Windows written by a German company called Combit. Like all good libraries, it contains a call which lets you establish the version number of the library. Only in this case... well, I will leave it to the manual for version 3.5 to explain:

> EMF-files can be implemented using 32-Bit, but projects which contain such graphic files cannot print these using 16-Bit.
>
> ***Version Number***
>
> LlGetVersion(VERSION_NUMBER) passes e.g. 3.125 as value (the value after the decimal point must be multiplied by 4, i.e. 3.125 corresponds to 3.5).
> LlGetVersion(VERSION_MAJOR) returns 3 as usual
> LlGetVersion(VERSION_MINOR) 500.

Nothing like the Teutonic sense of humour eh? So here's question 1: if `LlGetVersion(VERSION_NUMBER)` returns 3.1415, and `LlGetVersion(VERSION_MINOR)` gives you 720, what day of the week is it?

PRIZE CROSSWORD



ACROSS

1. Follow through the first competitive event (5)
4. Entity character @ praise (9)
9. Bit-wise logically (7)
10. Double-ended transistor (7)
11. Sage in the show latterly (3)
12. Secret time in searching (7)
13. Cream cakes in European hide-outs (7)
14. Sort of dilate endlessly, sloshing to and fro ... (5)
16. ... with an infinite S/N ratio (9)
20. Essential devices at the other end of the channel (9)
23. Nem con when we do this (5)
25. Device to change with hesitation (7)
27. NOT a strike but a total crash (7)
28. Lady's palendromic language (3)
29. Male, though old, coped (7)
30. One-to-one training (7)
31. Crazy with hot stuff (9)
32. Very keen to get 23 out (5)

DOWN

1. Early IBM product making arrays (9)
2. After mad boar, young Edward gave up completely (7)
3. And in Rome somehow learn for ever (7)
4. With irritation she goes with headless boy to endless dance (9)
5. Work surface produced by 1 dn? (5)
6. Use limp approach to force effect (7)
7. Somehow rely, gui with far from beautiful anger (4,3)
8. Deservedly gets an income (5)
15. Tool for downsizing (3)
17. Reduces the energy flow (9)
18. Journal once amassed in a 5 (3)
19. Cyclamate bribe (9)
21. It carries signals over the Tunnel (7)
22. Apparently unreal number (7)
23. Curved structure I have briefly put in store (7)
24. Searching around at depth (7)

SOLUTION TO APRIL'S CROSSWORD

ACROSS:
1. CONSOLE 5. KERNING 9. REINSTALL 10. GLAIR 11. ELEVE 12. LABELLING 13. TELLERS 15. TANKARD 17. ANALYST 19. DECRYPT 21. INHIBITOR 23. NUBIA 25. ICONS 26. LANDMARKS 27. YIELDED 28. SUSPECT

DOWN:
1. CURRENT 2. NOISE 3. OBSCENELY 4. ENABLES 5. KILOBIT 6. REGAL 7. IMAGINARY 8. GARAGED 14. LOATHSOME 16. NICKNAMES 17. ACIDITY 18. TOTALED 19. DARINGS 20. TRANSIT 22. BASED 24. BARGE

STOB

The All-New Adventures of Verity

Media agony

With so much ill-informed IT coverage in the media these days, Verity Stob receives sack-loads of letters demanding more truth, justice and balance in matters technical. Like these.

Many of you have written to ask me about the new version 4.0 Help file format. A typical offering from J Stuffon of Basildon:

'Dear Verity, I have just sunk the wrong end of four hundred nicker on a 32-bit compiler, or "interactive development environment" as it is pleased to call itself. The paper docs are abysmal – real bottom-wiping material – but the help file is even worse. If I press F1, it just sits there with a ridiculous animation of a fountain pen writing pages in a book until NT runs out of swap space. I have yet to see so much as a table of contents. But the review of this product, which I read in a Certain Magazine, said that it had "full, cross-referenced online help, including the 32-bit API". Have I been done?'

Yes, Mr Stuffon, I'm afraid you have been slit up a treat and done to a turn. However, you shouldn't blame the article for misleading you; the phrase you quote comes originally, of course, from the manufacturer's Reviewer's Guide – where else is a busy journo to get his information? The Help file itself, if you take a DIR, is tens of megabytes in size. A moment's thought will show you that there is no way that anybody could have generated this much documentation about a compiler. The need to justify the increasing use of CD-ROMs has led to the introduction of huge help files with little or no meaningful content, which exist in effect only to be indexed. It's just one of those things we are going to have to learn to put up with.

On a more cheerful note, P Piranha (Ms) of Ilford asks:

'Dear old Verity, I have been an avid reader of *Byte Magazine* for many years now. In common I think with many others, I very much enjoy Jerry Pournelle's fine column, the best thing in the magazine, and I always turn to it first. Yet I cannot help but feel that the time I invest in reading Mr Pournelle is rather wasted, as he nearly always writes exactly the same things. Is there anything to be done about this?'

Well, we have good news for you, Ms Piranha. It turns out that you are not alone on this one, and we have devised rather a neat solution, although I say so myself. Imagine a bitmap code where '1' means Roberta is revising her flash card program for teaching American children to read, and is contemplating porting

it to the Macintosh, '2' stands for an attempt to install QEMM on a Windows 95 which has stalled because it won't recognise the jukebox CD-ROM player, '4' means that he has persuaded Larry Niven to try out a new lozenge-shaped mouse, following a successful trial on the beach hut PC, and so on. I think it is fairly clear that, using this system, the content of Mr Pournelle's column can be summarised in a single byte (no pun intended!), so everybody can enjoy his anecdotes without actually reading them. The values for the next three months are 0xFF, 0xFE and 0xFF, by the way.

And less of the 'old', Ms Piranha.

S Trauma-Menace of Chelmsford, a busy executive if I am any judge, writes to ask if 'they have got around to inventing a laptop battery which lasts long enough – I seem to remember something about this in a 1978 Tomorrow's World'.

In short, 'No', Mr Trauma-Menace....

Actually, this is the long answer too – you've written to the wrong person if you want all the gen on nickel-cadmium and jelly suspensions and what not. Anyway, we are still waiting for the gas-powered vacuum cleaner James Burke promised in 1971.

The Internet intrudes (pshaw! yet again!) into ordinary life, as J Foxtrot of Colchester reports:

'I used very much to enjoy listening to the *Today* program on Radio 4, but recently they have started reading out their email address on the air. Until Sue McGregor started intoning "Beebeeseedot see-ohdot yewkay" with embarrassing ponderousness, conveying all the understanding of that lucky monkey which will one day type out Shakespeare, I used to think of her as a Queen Ayesha of the Wireless before whom all true men loved and perished. Now she is but another Anna Ford type. Can you help?'

Alas no, Mr Foxtrot, it is beyond even my power to stop Miss McGregor from making a fool of herself in this distressing way (although I have had some success with my campaign to get Peter Hobday to shut up about his camellia). I can only suggest you adapt my strategy for avoiding Thought for the Day – ie leap out of bed as soon as it comes on, turn on the shower full blast and sing loudly.

Finally, P Piranha (Ms) of Ilford asks:

'Dear old Verity, I have been an avid reader of *The Guardian*'s Computing section on Thursdays for many years. Of recent times, while hunting for the bits written by Jack Schofield, I have frequently stumbled across Bill Gates' syndicated column. So unctuous and smug is his material that twice I have ripped up the whole of *Guardian 2* in an uncontrollable rage, and consequently lost that day's television schedules and VIDEOplus+ codes. What should I do?'

Ms Piranha, it seems to me that either you must learn to control your temper, or borrow next door's Daily Express *for the telly. They won't mind.*

And if you call me 'old' again, I shall spit in your eye. ■

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Ease of Learning	9.1	7.1	8.8	7.7
Ease of Use	8.3	7.2	6.8	6.3
Versatility/Features	10	8.7	8.8	8.6
Compatibility/ Power Consumption	6.7	6.5	6.6	7.4
Speed of API Calls	0.9	1.2	10	4.1
Final Score	**8.5**	6.5	7.5	6.6

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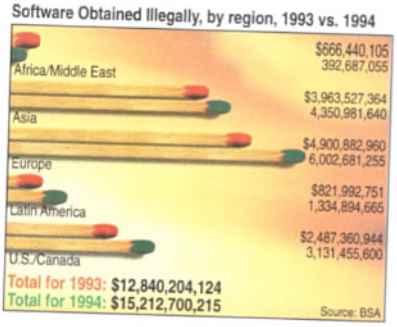
Software Obtained Illegally, by region, 1993 vs. 1994



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