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JUNE 1998

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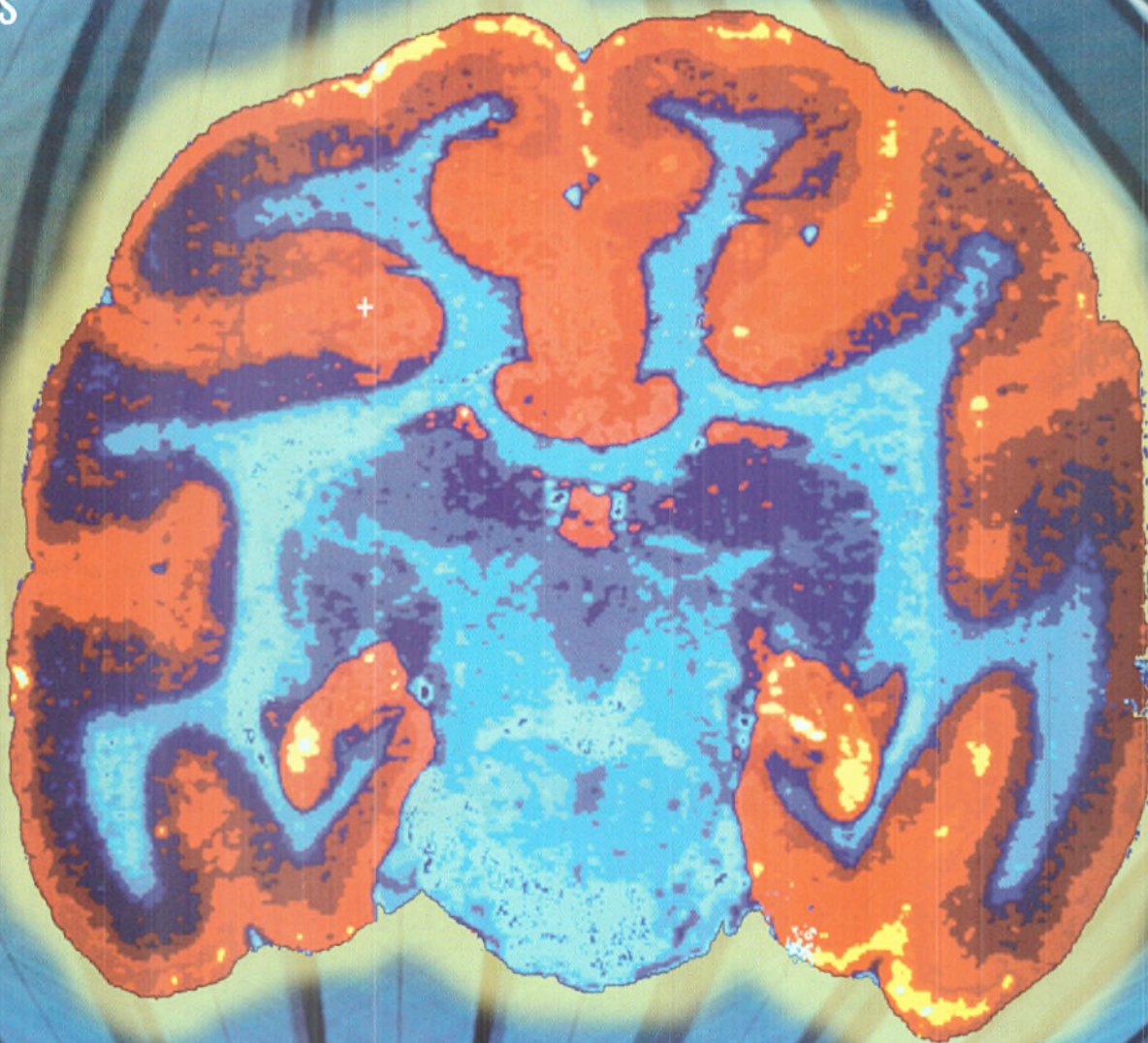
Samba across
the network

Moore's law
It is the end
my friend

Java
ready-made

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create new
variables

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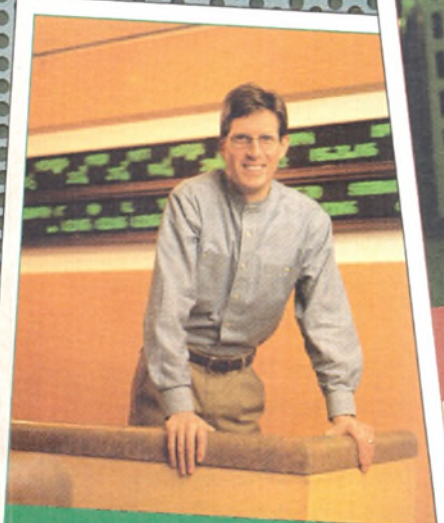
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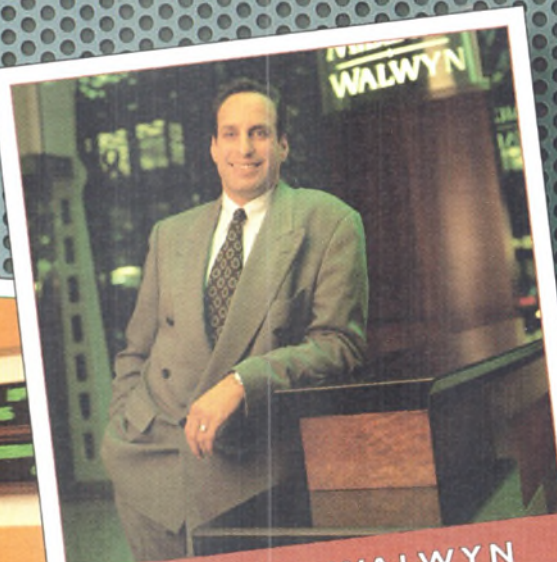
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Basic Defect

Defect Id: 36 Priority: Medium Status: Closed Assign To: J.L. Liu

Product: DrawCAD Module: Display Version: 2.00 Submitter: G. Tam

Date: 03/01/94 Time: 14:36:43 Copy To: admin

Synopsis: Overlapping viewports can't be displayed

Detailed Description

To reproduce:

- 1) Load DrawCAD by clicking it's icon
- 2) Create two viewports
- 3) Choose EDIT, OVERLAP command

Comments

Attached Files: demo.log

System: LCP286-4

Opened Date: 03/01/94

Closed Date: 10/21/94

Days Open: 234

Last Change: 10/21/94

Changed By: ad

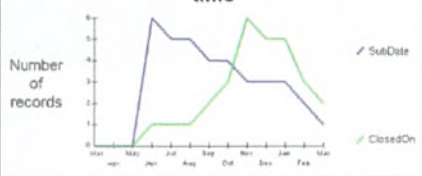
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Are we too kind?



Once upon a time, before the PC was even a twinkle in IBM's eye, I worked for a very large company. One of the top 50 in the world, with factories in over 70 countries and products that are household names in every high street. Yet I recall being told over and over again, 'Our customers are our biggest asset.' Hopefully those customers were usually satisfied, if not we actually *wanted* them to complain! We could then contact them, investigate the problems, and take action. If a product was faulty, we said so ('Fell short of our normal high standard' was a favourite phrase!), we replaced that product, and offered a bonus of some sort too. If the customer was at fault, we told them – but very tactfully. Done properly even this could maintain customer loyalty. I recall once recommending Rentokil to remove bugs (the old fashioned tiny fellows with legs) from a kitchen (and not our product) before the Health Inspector called, and being thanked by the complainant for being so helpful.

If there was a problem but we heard nothing, it meant only one thing; the customer had switched to a competitor. We did not like that; we had lost an asset.

We expected our suppliers to provide comparable levels of quality and support. Materials had to arrive on time and to the agreed specification. At least, I thought they did, but I gradually discovered that quite different standards were accepted by our IT department for computer products. When

yet another new system ran late or performed badly I gathered we had to wait patiently until Messrs I**** or H**** or D**** got round to rectifying the relevant technical shortcoming. It all seemed very leisurely. As indeed did the systems themselves at that time. I recall an IT supremo answering complaints of slow response with the words, 'People get used to staring at screens waiting for something to happen.'

He might, but not the rest of us. When PCs arrived many non-IT people like myself grabbed one. We found that despite our limited skills we soon had small systems up and

the fault lies in the software I am using and I will have to devise a workaround. My clients stare at me with virtual disbelief when I tell them that it is normal to wait for months or even years for software companies to issue bug fixes. 'How can they keep in business with that attitude?' they ask. They clearly think that we (developers) are crazy to accept such a situation. So why do we?

I have recently reviewed Visual dBASE 7 and while doing so have been in contact with Borland and browsed through the VdB newsgroups. I suppose one can understand the supplier defending their

local journeys so you have to retain your old vehicle for these. After three months you are invited to return it to the dealer for correction. At a cost to you of another £1000 (10% of purchase price). Even then, you need to make sure your AA/RAC subs are up to date before venturing too far! Of course, for cars and any other non-computing product this would be laughable, so why do we accept it with languages and other software? Are we so involved in the complexities of our programming that we have abandoned the every day common sense of a normal buyer? Indeed, have we meekly accepted our demotion from being a valuable asset to an irritating liability? Incidentally, I mention Borland as an example, I doubt if it is any worse – or better – than others.

Perhaps it is all linked to another phenomenon I find very strange: the lemming-like infatuation with whichever is the current No. 1 software house. Over and over again I see comments that say forget the product quality, you must buy from the biggest supplier, 'In case ***** is not around in a few years time.' Word is preferred to WordPro or WordPerfect, Visual Basic to Delphi, Access to VdB, not on merit but on the supplier's name. It used to be like that with IBM, until that bubble burst. Networks had to be Novell until quite recently but now I hear that they have to be NT, as 'Novell will not last.' Just as well this attitude does not apply to the car industry. By now, we would have a choice of any make we liked, so long as it was Ford...

Bob Rimmington
Independent consultant
BobRimmington@compuserve.com

Are we so involved in the complexities of our programming that we have abandoned the every day common sense of a normal buyer?

running in less time than it took to discuss specifications endlessly with system analysts. We also found that much of the software did in fact 'fall short of normal standards' but even partial rectification took time and cost money. I was told these were the inevitable birth pangs of a young industry and it would improve very quickly.

Time moves on. For ten years I have been an independent developer. If I write an application for a client and he hits a problem, he expects quick action. And he gets it; usually a revised EXE is emailed or otherwise transferred within 24 hours. Sometimes, of course, I have to ask for a little more time if it is a major problem. Sometimes I have to explain that

decision to release a product that clearly was not quite ready. What astonishes me though is the way other users object to any criticism and rush to Borland's defence. It is almost like a fan club supporting their idol through thick and thin. Why though? Does putting a protective shield around any supplier actually help them to compete in the market?

VdB 7 Professional costs £250. A 7.01 inline upgrade clears most (but not all) bugs. You can indeed download it free, but if you want it on CD it will cost you £25 – 10% of the original purchase price. Could any other industry get away with this? Just imagine paying £10,000 for your new car. It is too unreliable for anything beyond



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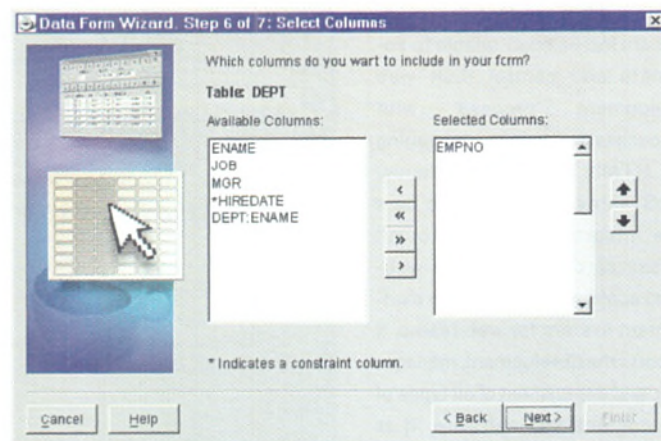
Solutions for a small planet

Oracle gives three tiers for Java

Oracle has made a '300% commitment' to Java, with support for all three tiers of the network computing platform. It will provide 100% pure Java support in the client, application server, and database server, by incorporating Sun's platform independent Java across its product line. The intention is to enable the development of database applications for a broader range of users, including electronic commerce, and data warehouse and OLTP applications.

As part of its 'roadmap for Java support in 1998', Oracle has released JDeveloper Suite, designed to be an integrated set of products to build and deploy enterprise database applications using Java. In addition, the database Oracle8, release 8.1 (expected at the end of the year) will incorporate Java. This will include a JVM to run data intensive Java applications inside the database server and support for Enterprise JavaBeans. Oracle has already shipped a Java SDK for this 8.1 release to ISVs. Finally, it has expanded its developer program, the Oracle Technology Network, to assist Java developers with database applications (<http://technet.oracle.com>).

Available immediately, the JDeveloper Suite includes AppBuilder for Java V1.0, Oracle Application



Server 4.0, Symantec's Visual Page HTML editor, and Oracle8 Database Server. Additionally, developers will receive a one-year membership of the Oracle Technology Network.

Embedded within AppBuilder for Java are Oracle's JDBC drivers, which produce 100% pure Java or native connectivity to Oracle7 or Oracle8. It is integrated with SQLJ, a standard precompiler for embedding SQL directly in Java source code, and with Oracle Application Server 4.0, to take advantage of special server services.

Another of AppBuilder's features is that Java developers can create reusable 'JCorba cartridges' for deployment on the Oracle Application Server. These are compo-

nents that contain business logic written in Java and which are accessible through an embedded Corba 2.0 compliant ORB.

Dynamic HTML development is possible with AppBuilder for Java through its use with the Oracle Application Server's JWeb cartridge. This enables developers to write Java code on the middle tier, which dynamically generates HTML to be sent back to a client.

The 'roadmap for Java support' announcements follow up the products delivered last year, including Oracle Web Developer Suite, Oracle Application Server, and the Java-enabled version of Oracle Applications 10.7 NCA.

www.oracle.com

Borland International has a new corporate name: **Inprise** Corporation ('Integrating the Enterprise'). Inprise will retain the Borland **brand identity** for a group of developer tools, such as C++ Builder, Delphi, IntraBuilder and Visual dBase. www.inprise.com

A data-pivoting **grid control**, from **VideoSoft**, supports Microsoft's VJ++ 6.0 as well as VB. **VSFlex 3.0** has 72 new features, including data-aware capabilities, in-cell editing, file compression, grid rotation, and the ability to save grids with their data. www.contemporary.co.uk

VSView 3.0 is another tool from VideoSoft for Microsoft Java developers. It is compatible with **VJ++ 6.0** and offers extra printing and previewing functionality along with a facility for end-users to create their own dynamically generated reports from **Java** applications. www.contemporary.co.uk

The Object Management Group (**OMG**) has announced new **specifications** for Java-to-OMG Interface Definition Language (IDL) mapping. These give programmers the ability to convert **Java** APIs into C++, Cobol, ADA, Smalltalk, or other client/server APIs supported by Corba. www.omg.org

An introduction to software development for the **Motorola** DSP56800 family will be provided by Metrowerks. They are developing a Discover Programming for DSP product, including all the hardware as well as the **CodeWarrior** software development tools necessary to begin **DSP** application development. www.metrowerks.com

Embedded but revealed

WindView 2.0 is an enhanced GUI-based diagnostic tool from **WindRiver**. It provides a detailed view of the dynamic operation of an embedded system; developers can see the interaction among tasks, interrupt service routines, and system objects in an application. It works like a logic analyser, logging and time-stamping events of interest, including context switches, semaphore and message queue handling, watchdog timers, interrupts, and signals. The information is presented through a Windows GUI.

Analysis capabilities in **WindView 2.0** include the addition of open **Tcl** (Tool command language) and **C++** APIs to **WindView 2.0**'s event log. The **Tcl** interface provides a mechanism allowing the user to customise and extend the **WindView** debugging environment.

A feature introduced with version 2.0 is **Triggering**, a new **VxWorks** feature that makes it possible to capture a more concise event log. By assigning actions to specific operating systems events developers can log relevant events only.

This version of **WindView** runs on Windows 95 and NT.

www.windriver.com

Resizing

The design-time ActiveX control, **Olectra Resizer 2.0**, is designed to enable VB and Delphi developers to add resizing and layout management to forms, without any programming.

KL Group's control provides drag-and-drop tools so developers can easily add resizing and layout management to applications. It enables end-users to make optimal use of their screen size and resolution, without sacrificing font legibility.

Version 2.0 includes the ability to add proportional scaling to any form, automatic handling of font and resolution changes, and increased overall performance at runtime.

www.klg.com

The continuous WebSynergy

TeeChart Pro ActiveX, a collection of animated graphing aids and **pivot-table** tools, has been upgraded. V3.0 includes pre-designed charts, such as Scatter, Pie, and BarGraph, and a number of 2D and 3D formats. The component, from **TeeMach**, costs £69 for a single-user licence. www.componentsource.com

A new release of the **Informix-4GL** products (7.2), including the Rapid Development System, interactive debugger, and compiler, provides improved deployment facilities and **Y2K** problem support. Increased performance is achieved with the inclusion of the latest Informix client libraries. www.informix.com

Cayenne Software is to integrate its **ObjectTeam** with **Uniface Seven** from Compuware. The plan is to couple the Cayenne analysis and design modelling repository with the Uniface **repository** for component development and deployment, covering the full application lifecycle. www.cayennesoft.com

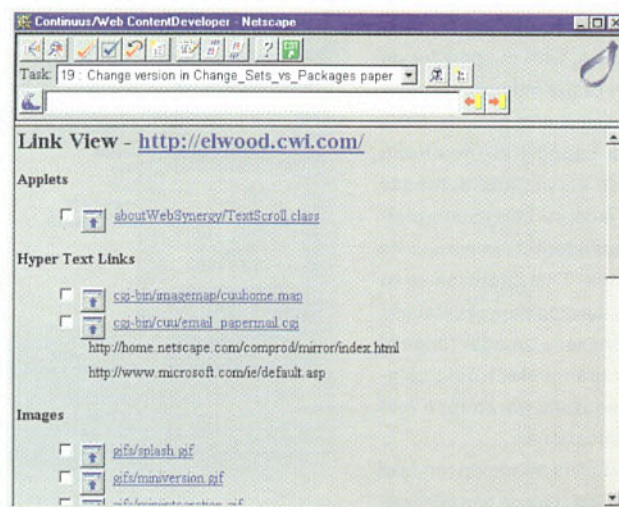
Wall Data is releasing **Cyberprise Server 2.0**, Enterprise Edition, a universal **web** application server platform. Designed to run on Windows NT, the product is the foundation platform for Wall Data's line of Cyberprise web server products (Host, Tools, Data, Channels, and Services). www.walldata.com

Brio Enterprise 5.5 is a suite of products that supports Microsoft's **OLE DB** for OLAP API. This will allow Brio users to uniformly access and query data stored in a range of **OLAP** servers, regardless of location or type. www.brio.com

Continuus believe that organisations are increasingly unable to co-ordinate and control their web development process with approaches that focus on managing text, HTML, or Java. Continuus/ WebSynergy is designed to be a more integrated solution for all classes of contributors to web-based applications. A change management system for web teams, it supports the development, management, and deployment of all types of web content and software. It is aimed at the problems of co-ordinating distributed development teams, and trying to ensure the quality of web-based information.

The WebSynergy content client is browser-based, allowing participation as part of an extended web team. Employing 'Surf&Act', a Continuus web content development paradigm, users can add and change web content with the development tools they already use.

There is a version of Continuus' task-based change manage-



ment system, designed to meet the requirements of web development. It includes Web Workflow (a configurable process of development, testing, approval, and deployment of web changes), Team Co-ordination (assigning tasks to members for the management of diverse and distributed teams), and Deployment (enabling distributed web

servers to automatically keep the contents of each server synchronised as changes move through the task-based workflow).

Finally, the WebSynergy Server – a Change Management Server for web development teams – provides a scalable repository for managing the development environment.

www.continuous.com

Windows 98

Windows 98 is officially scheduled to be available to the world on 25 June 1998. Retailing at approximately £161, upgrades for Windows 95 and 3.1 users should be £85.50.

Improved performance is one feature. Opening applications, accessing the Internet, viewing graphics, and shutting down the PC will take less time than Windows 95. In terms of the UI, the browser metaphor is moved centre stage for exploring the PC and beyond.

Accessing help can incorporate the new web-based online help system. Similarly, Windows Update, a centralised web-based resource site, allows registered users access to the latest drivers and system updates. Hardware and entertainment functionality includes native support for the universal serial bus (USB) and the provision of DVD and television broadcast capabilities.

www.microsoft.com

Java in parts

PARTS for Java Professional 2.5, from ObjectShare, is a productivity tool with support for team co-ordination, automated database development, and recent JDK extensions. It is not locked into any particular compiler or library set, and the user can compile and manipulate code outside of the tool itself.

For team development, **PARTS** Professional provides integrated version control and configuration management. It includes Inter-solv's **PVCS**, support for creating and managing repositories, and the ability to compare files quickly and merge them. ClearCase will be supported in the next quarter.

For building database applications there is the inclusion of **JavaBeans** for JDBC and a Form component that automatically generates user interfaces. **PARTS** includes a **jKit/Grid** product and enables the automatic creation of tables from databases queries. There is **OracleLite 3.0** to allow developers to make use of Oracle's object-relational technology and to create stored procedures in Java. Applications created against OracleLite can easily be later targeted against Oracle8 for scalability.

Sun's recently released **Swing** components (JFC 1.1) are included. These user interface controls allow the creation of portable, device independent applications.

PARTS for Java Professional, for Windows 95 and NT, is available directly from ObjectShare. It costs \$1495, and includes full licences for Iona's **OrbixWeb 3.0**, Oracle's **OracleLite 3.0**, Sun's **JDK 1.1.5**, Microsoft's **SDK-Java**, and **Netscape Navigator 4.04**.

www.objectshare.com

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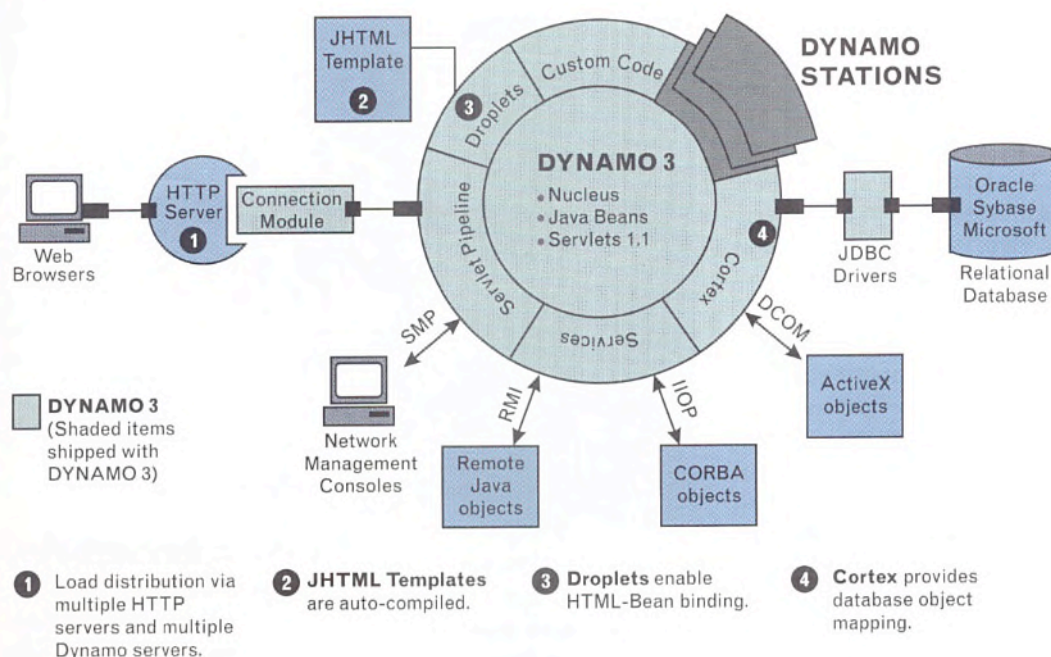
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Dynamo: ART, but not as we know it



ART Technology Group's Dynamo 'Relationship Commerce Suite' is a suite of tools for building commerce-enabled Web sites which has now reached version 3.0. The suite is made up of the Dynamo Application Server, the Dynamo Retail Station, the Dynamo Profile Station, and the Dynamo Ad Station. What makes Dynamo unusual is that it is 100% Java on the server side and has been tested and certified on Windows NT and a variety of Unix platforms.

Rather than opt for client-side scripting, or in-page server side scripting like ASP, ATG's solution

revolves around 'droplets', Java-Beans that perform the app server functions, and special attributes embedded into the HTML. The scripts to automate operation of server-side Beans, servlets, or non-Java objects, such as ActiveX controls, are kept separate from the HTML pages and the special tags in the HTML interpreted by the application server, which then executes the functions in the script code.

Dynamo lives on any JDK 1.1-compliant JVM and talks to Web servers via ISAPI (for IIS), NSAPI (for Netscape servers), or the native

Apache API. Database connectivity is provided through JDBC, with native drivers available for Oracle 7.3, Sybase SQL Server 11, and Microsoft SQL Server 6.5.

The Dynamo Stations add extra server objects for organising and deploying ads, enabling electronic commerce, and profiling user behaviour and personalisation.

Pricing starts at \$10,000 for a single CPU license, while an evaluation version of the Application Server is available for download at ATG's website.

www.atg.com

Thesaurus and **Thesaurus/Dictionary** components are provided by **WordWeb Developer** for **Delphi** and **C++ Builder** applications. It has a customisation program enabling the creation of sub-sets of the original database. It is based on the freeware **WordWeb** program and costs £49. www.x-word.com

AllChange is the **configuration** management software tool from **Intasoft**. Release 4.3 is designed to be easier to install and configure. FTP has been included for cross-platform access. It runs on Unix, Windows 3.x, 95, and NT. It is priced from £3955. www.intasoft.co.uk

Apptivity 2.1, the application server and development tool for Java, features HTTP tunnelling for deployment of web applications, Corba support, an integrated distributed debugger, and an expanded database driver set. www.progress.com

The **CCS2** (Cascading Style Sheets, level 2) specification has been released as a W3C Recommendation. It provides designers with improved typographic control, support for cross-media publishing, and for presentation of documents in multiple languages. It is backwards compatible with features introduced for CCS1. www.w3.org

Mortar 2.0 is a web authoring and management suite from Big Picture Multimedia. It supports **Java 1.1** and **Dynamic HTML**. A **Site Grabber** and **Mapper** allows developers to grab any website and create a local working copy that can be updated. Windows 95 and NT. www.opensoft.net

Multimedia made easy

FXTools GOLD V5.0 is a set of custom controls, including imaging, video, and audio drop-in components, that come in 16-bit VBX and 32-bit ActiveX formats. The **Image**, **Label**, **Text**, and **Shape** controls provide a range of graphics management properties.

FXTools' Image control, **FXImage**, can load **BMP**, **DIB**, **JPG**, **JIF**, **PCX**, **PNG**, **RLE**, **TGA**, **TIF5.0**, **WMF**, and **WPG** image formats. The control translates these formats to a memory-based **BMP**, which may then be exported to any of the other controls in **FXTools**. It supports **ePIC** (enhanced **PIC**), which can provide faster display and better compression than **JPEG**.

The **FXSnd** control adds **DirectSound** file streaming support. Apparently, this lets you use the mixing capabilities of **DirectSound** without having to load the complete sound file into memory. There are more methods to facilitate programming **DirectSound** commands, and a buffer size property. **FX Tools GOLD** costs £189.

www.componentsource.com

Taking the zip

Active Delivery V1.2 is a toolkit for developers to create self-extracting zip files. **Inner Media** is planning a summer release of the product, and believe that since **Active Delivery** is well suited for use within **Active Server Pages**, one use of the tool is to enable web sites to package custom data on demand for delivery over internet connections.

Version 1.2 includes the ability to: create and modify **Startup** menu items, replace system and other files that are in use, and create multi-volume disk sets.

www.ActiveDelivery.com

Neural networks and harmony for all

Microsoft is extending **Windows CE** with hard real-time capabilities, to enable developers to create embedded solutions for more demanding, **real-time**, and mission-critical applications. New features, scheduled for the first half of next year, include support for nested interrupts, better thread response, additional task priorities, and **semaphores**. www.microsoft.com

For streaming media distribution and professional media authoring, **Microsoft** has announced a new **multimedia** file format strategy. It will integrate support into future Windows for two formats: ASF (Advanced Streaming Format) and AAF (Advanced Authoring Format), succeeding **AVI**. Specifications and SDKs are on the Web. www.microsoft.com

Cambridge Control's MATLAB, version 5.2, includes **ActiveX** support and features for developing **GUIs**. The technical computing language runs on Windows 95 and NT, Unix, and Macintosh platforms. www.camcontrol.co.uk

Single-source support for all versions of WinHelp and **HTML Help**, together with a conditional marking feature to identify designated platforms, is provided by WexTech's **Doc-To-Help 3.0**. www.softexport.com

The **Tornado** for Java development environment has passed Sun's Java Compatibility test suite. It will provide an environment fully compliant to the Java Standard. The **JVM** has been mapped to the Tornado environment to specifically meet the needs of **real-time** tasks. www.windriver.com

Every year, Computer Associates organises a big event in New Orleans to showcase its new products, explain its strategy, and provide technical sessions. This year, about 25,000 people attended from all over the world. The focus was on TND, the next generation of Unicenter TNG (infrastructure management), and on Harmony. The latter encompasses Jasmine (an object-oriented database), Ingres II (an *n*-tier relational database), Opal (a Windows-based application-integration product for creating Web-based GUIs to legacy programs), and IDMS and Datacom (host-based databases).

Harmony is dubbed a 'comprehensive information infrastructure' as it integrates everything from the workgroup level to the enterprise level and offers independence from data sources and client technologies. The goal is to have Jasmine as an object-oriented repository and the Meta4 GUI-building technology as a common glue across all Harmony products. Meta4 is currently supported by Opal and Jasmine and will soon be added to Ingres II. V1.2 will add support for double-byte characters and multiple languages. In the next quarter, Harmony will be ported to AIX, HP-UX, and SGI in addition



to Windows NT. The full Harmony will be agnostic in the great 'COM vs Corba' debate, hence Opal will support Corba. Other standards embraced by Harmony include Java, RMI, VRML, and XML.

The next big thing announced by CA is Unicenter TND. It is planned for 1999. Two highpoints of TND are the time dimension, which lets users travel through time as they manage their infrastructure (both past and future), and Neugents. These are software agents that apply the principles of neural networks to learn, predict, and resolve problems before they actually arise (the figure above shows the prediction of a possible

failure due to happen in 20 minutes). Neugents dealing with performance and availability have been incorporated immediately in V2.2 of TNG.

The keynote speakers included Bill Gates who announced that Windows NT 5 will feature CA's 'Real World Interface'. This is a WBEM (Web-Based Enterprise Management) application based on the TNG framework which produces management views of WBEM data, events, and alerts. Bill Gates commented that we should 'expect the same reliability [from operating systems like Windows NT] as the electricity network'.

www.cai.com

Smartcard access from C++

Version 2.2 of LUCA, a software development framework for data communications, includes support for smartcard readers. With LUCA's abstracted persistence layer, accessing a smartcard is achieved by using the same program logic as for reading and writing a disk file, or transmitting and receiving a file. The principle followed is that developers should not have to use completely different API functions for different protocols and transport media.

LUCA 2.2 is available for C, C++, Delphi, VB, and Java.

www.siliconriver.co.uk

Pure Java, pure object database

The direct storage and retrieval of Java object models, without translation, is the feature of Object Design's 'Pure Java, Pure Object Database', the DBMS ObjectStore PSE Pro 2.0. Object Design claims that its Automatic Data Management capability delivers performance and productivity gains over other databases that require added code to translate between Java objects and relational tables. With the new release, ObjectStore PSE Pro provides full querying and indexing capabilities, plus support for Sun's JDK 1.2 collections.

The 100% Pure Java DBMS has a 450 KB footprint, and runs anywhere Java does. It requires no tuning and can be deployed automatically over the Internet or corporate networks, along with application-specific Java classes, to reduce porting and administration costs. Its portability and the size of its footprint mean it is aimed at Java applications on platforms ranging across embedded devices, thin clients, desktop and mobile PCs, application servers, and web servers.

www.odi.com

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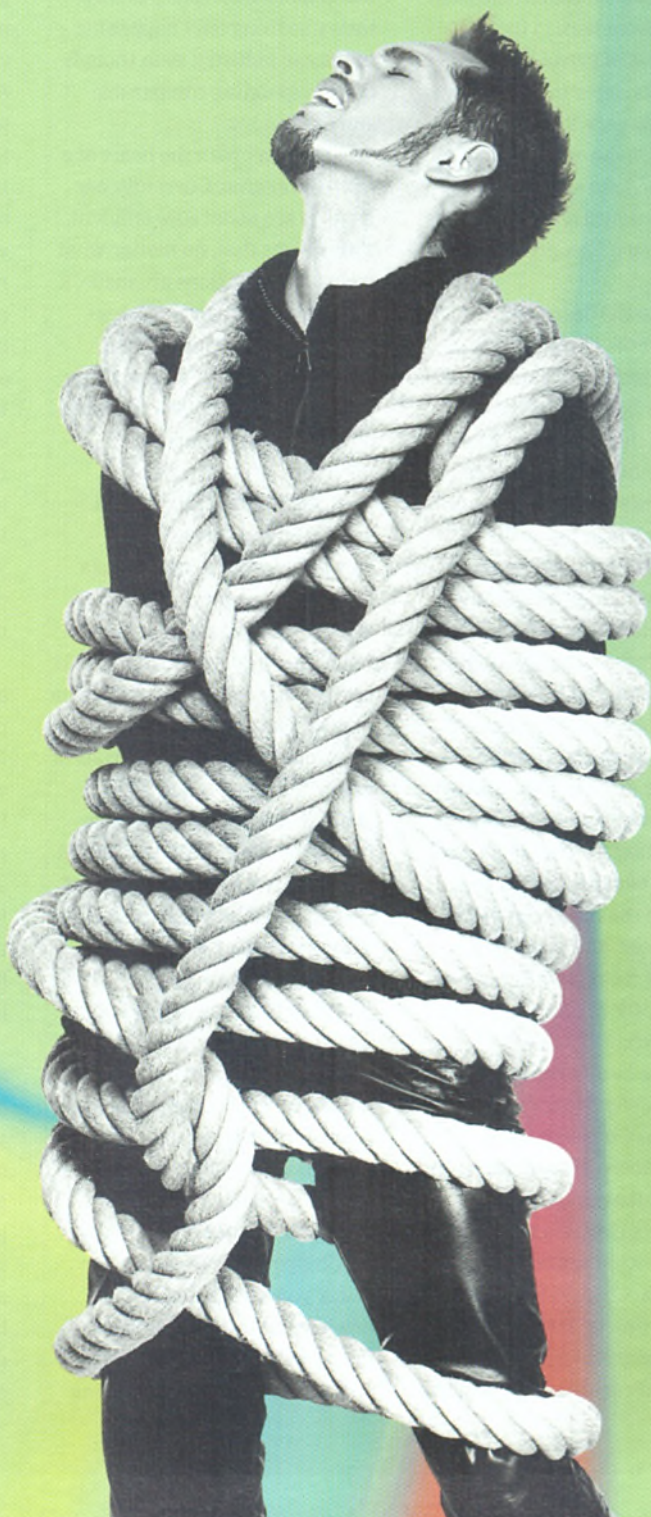
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Moore's Law no more

Though everybody grumbles about the rate of hardware obsolescence, the industry relies on it. But what if it stopped? Jules investigates.

If the car industry had achieved in the last thirty years what the computer industry has done, our cars would go a million miles an hour, get from here to the moon on one tank of petrol, and it would be cheaper to buy a new one than to park it overnight in London. On the other hand, the cars would take six months to start, and they'd crash five times a day, so not all progress is good, I guess.

We owe the dramatic developments in computers to Gordon Moore, a co-founder of Intel. Way back in 1965 he predicted that computer power would double every eighteen months, forever (or at least until 1975, which is as far as the semiconductor industry could see). He went public with this mad prediction and the fact that he was proved to be dead right earned him the title of Very Clever Chap. In 1975, the trend showed no signs of slowing down, nor did it in 1985, and by 1995 we were bounding ahead with Pentiums and Alphas, and everyone who had nailed their colours to the mast of growing power, speed, and complexity thought it would last forever. We all call it Moore's Law, after all.

But some Very Clever Chaps are telling us that the writing is on the wall for Moore's Law, and when one of those chaps is Gordon Moore himself we really ought to take notice.

Moore's Law is sustained not by a beneficent universe, but by hard work. Chip geometries are being shrunk by intense development and research effort, which costs squillions of dollars.

The money is worth spending because the paybacks from a new process are enormous. What's much more interesting is why the same thing isn't happening in the car industry, even though they're spending comparable sums of money.

Let's start with the heart of a car – the engine. Currently, car engines are about 40% efficient. This means that, no matter what technical inventions are made, a car engine will never achieve improvements of more than 150%. In fact, even that is a long shot. Efficiency of 40% is beaten only by a Chinaman on a pushbike. It's better than unaided Shanks' Pony, and it knocks spots off electricity generation and distribution (a fact which the proponents of electric cars would do well to remember). In real terms, 40% is pretty amazing, and probably the best we'll ever achieve.

Consider, too, the materials of which the car is made. The chassis, bodywork, and works represent about a tonne of metal. We could make the car lighter if we could find stronger materials to make it out of. By spending enough money, we could probably halve the weight of a car. But no matter how much money we spend, there's only so far we can go, because strength comes from matter, and matter has mass. We simply cannot make a car which weighs a kilogram. Physics won't let us.

Chippiness has done well for thirty years because it is nowhere near the theoretical limits. Making a chip smaller and denser was an engineering

and developmental problem, not a physical one, and just like weeds in a freshly-ploughed garden, the technology has expended geometrically to fill the resources available to it. However, as speeds rise, geometries shrink but signals get fatter, meaning they no longer fit inside the tiny connecting wires, and the chip's function is wrecked by its own crosstalk radiation. More transistors mean more heat, more speed means more heat, and in ten years time a Pentium operating at 3GHz will be burning 400W – which is enough to make it glow a dull red. More heat means less speed, less operating life. Consider even the tiny currents involved – if you can count the electrons in a circuit then you've got lots of noise, and noise means errors.

The point is that while there are certain engineering problems left to solve, and Moore's Law will continue for a while, we will hit the absolute limits, imposed upon us by the physical laws of the universe, sometime in the next twenty years, and we will hit the limit of economic viability sometime before then. At that point, we'll all get a great big shock.

When we can't pack any more transistors onto a die, attention and money will turn to a field where development can pay dividends, and that field will be software science. The name of the game will not be system-level standardisation, or maximum generality as it is now. What will be valued is fitness for a purpose, pluralism, and even reducing chip complexity in the name of

parallelism and autonomy. Smart cards will be really smart, macrocell arrays will become the real general-purpose chips, and systems will be assembled around communication protocols.

When we're not expecting our chips and computers to become obsolete in six months, it will be impossible to 'upgrade' programs by making them prettier; because the inevitable slow-down will not be absorbed by faster chips. Hardware will no longer drive the software industry, and software will be forced to resort to real development and advance to survive. Software will become more specific, more vertical, and more modular, until eventually even core programs will be supplied as a kit of parts.

When 1-micron chip factories cost \$20,000, people will be making chips in their basements in much the same way that people make PCBs now. The border between hardware and software will blur, and just as a few high-level compilers can produce optimised microcode now, future compilers will produce optimised silicon alongside the object code. Programs might even reconfigure their processor hardware on the fly.

When technical advance is pure mind stuff, it will no longer require research departments connected to factories; it can be done by individuals and small groups. Invention and technical advance will be democratised, and consequently there will be a lot more of it.

It's all going to seem very strange – except, of course, to the people who are thinking about it now.

Email at jules@cix.co.uk. He hates writing biogs.





Dongles: software registration

After reading [last] month's EXE I decided to put finger to keyboard as requested to let you know my opinion of dongles. I despise them! Having spent a non-trivial amount of money on a software package I expect to be able to use it without interference. I resent having to use a dongle.

The situation gets ridiculous if you have multiple dongles hanging off the parallel port. As far as this end-user is concerned I *do not* have a normal program working smoothly and transparently. I do recognise that software piracy is an issue and as a software developer I recognise that companies need to protect products against unauthorised use since this may have an impact on my salary! I am a keen proponent of the shareware and *free* software ethos. I run Linux at home and have purchased the CRISP editor which is also mentioned in [last] month's EXE. This editor, in common with some other programs uses a software key and a licence server. This is a little tedious to set up initially but appears to work well once installed. I prefer this method of software protection.

Whatever dongle manufacturers may say there is a reliability issue. *Every* additional software or hardware component degrades

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the reliability of the system – it is down to basic probability and statistics! As a legitimate user of software protected by dongles I feel unjustly and unnecessarily penalised for using the software which I purchased to do a particular job. I try to avoid dongle-protected software wherever possible. I would prefer to see a registration style of software protection whereby legitimate users are registered with the provider with each copy of the software having a unique identifier embedded in the executable that can be used to verify authenticity and origin in cases where software piracy is suspected.

Dave Barrass
dbarrass@wallflower.demon.co.uk

The cost of piracy

Given the publication date of the dongle *Mayhem* I took the frequently interesting and often amusing column with a small pinch of salt, I thought Jules was playing to the gallery a bit.

Sadly, I have risen to take the bait offered by the Ray Lewis, MD of Aladdin UK.

I have used (non-Aladdin) dongles as a contract software engineer at my clients' request. No problem. As a user who moves between different machines during the development cycle of a project I find dongles a pain in the neck, they're always on one of the other machines but what the hell?

What really winds me up are people like Lewis who

claim that copying costs companies enormous sums of cash. I accept that if someone using a pirate copy paid up then the developers would make more money but I do not accept that the amount of piracy directly equates to the amount of extra cash. I would be surprised if 20% of pirates would pay up rather than go without. There never seems to be any mention of how the figures are worked out.

It's the same with music CDs and cassettes. Kids/people copy them because they can only afford to buy so many different albums, if they couldn't copy they would go without.

An argument in favour of (temporary) piracy, and I seem to remember reading a *SoapFlakes* article in favour of it, is something akin to 'try before you buy'.

Gordon Smith
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Top-down and outside-in

Jules' article for May raises some interesting concerns about the way in which we develop software today. I have to agree with him in several respects. Firstly, it is true that the Window-centric model of program interface is only of benefit in a certain subset of program areas. Secondly, Windows does have this severe bloat problem – the uptake of the CD as a distribution format would have been much slower

had Windows been more strict about the DLL concept.

One interesting point that was brought up is the way in which designing software has changed over the years, from a 'top-down' to an 'outside-in' approach. Both systems have their merits, and the way in which Jules highlighted this made the point for me. In a project that only lasts a short period of time (like a day or two) and in which there is only a small amount of design input (ie from one person) a top-down approach works very well.

It may still work well in situations where a command-line application is being written. However, if you have a group of people involved in design of a product, being able to design using the outside-in paradigm is very useful. From experience, most non-technical people have no interest in records, named types, and other internal constructs. They want something that's pretty, and drawing is a simple way to get a design point across. Once a design has been decided on, you can go on to discuss the way in which operations will take place. In fact, you end up doing a multitude of top-down developments, but from a set of different starting points.

At the end of the day, the whole debate comes down to a 'horses for courses' argument, and one solution is as good as another if it gets the job done in an efficient manner.

Paul Hart
email address supplied.

```

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<head>
<title>Lotus dev.net</title>
</head>

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, 204, 172" HREF="http://www.lotus-dev.net/"></MAP></td>
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    </tr>
    <tr>
        <td><font size="-4" face="arial,helvetica">&copy;1998 Lotus
Development Corporation. Lotus and Working Together are registered
trademarks of Lotus Development Corporation.</td>
    </tr>

</table>
</center></div>
</body>
</html>

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If you can't be bothered to type all this in,
visit www.lotus-dev.net and hit "press here".

The other side of the UI

Anyone involved in the design of an interface should be aware of the impact of the choices they make. Andy Brice gives some pointers for understanding the workings of the mind.

It has been said that if users were meant to understand computers they would have been given brains. But, in fairness to users, the problem is often that interfaces are not designed to take account of their strengths and weaknesses. I have struggled with my fair share of dire user interfaces, and I'm supposed to be an expert user.

An interface is, by definition, a boundary between two systems. On one side of a user interface is the computer hardware and software. On the other side is the user with (hopefully) a brain and associated sensory systems. To design a good interface it is necessary to have some understanding of *both* of these systems. Programmers are familiar with the computer side (it is their job after all) but what about the other side? The brain is a remarkable organ, but to own one is not necessarily to understand how it works. Cognitive psychologists have managed to uncover a fair amount about thought processes, memory, and perception. With apologies to psychologists everywhere, I will try to summarise some of the most important theory in the hope that this will lead to a better understanding of what makes a good user interface. Plus, I think it is interesting to look at the remarkable design of a computer produced by millions of years of evolution, and possibly the most sophisticated structure in the universe (or at least in our little cosmic neighbourhood).

The human brain is approximately 1.3 kg in weight and contains approximately 10,000,000,000 neurons. Processing is basically digital, with 'firing' neurons triggering other neurons to fire. A single neuron is rather unimpressive compared with a modern CPU. It can only fire a sluggish maximum of 1000 times a second, and impulses travel down it at a painfully slow maximum of 100 meters per second. However, the brain's architecture is staggeringly parallel, with every neuron having a potential 25,000 interconnections with neighbouring neurons. This parallel construction means that it has massive amounts of store, fantastic pattern recognition abilities, and a high degree of fault tolerance. But the poor performance of the individual neurons means that the brain performs badly at tasks that cannot be easily parallelised, for example arithmetic. The brain carries out its processing and storage using a complex combination of electrical, chemical, hormonal, and structural processes. Consequently the results of processing are probabilistic, rather than deterministic, and the ability to store information reliably and unchanged for long periods is not quite what one might hope for.

Memory management

Perhaps unsurprisingly, the brain has a similar multi-level storage approach to a modern computer. Where a computer has cache, RAM, and hard-disk memory (in increasing order of capacity and decreasing order of access speed) the brain has sensory memory, short-term memory, and long-term memory. Sensory memory has a large capacity, but a very short retention period. Short-term memory has a very small capacity but can store and retrieve quickly. Long-term memory

has a much larger capacity, but storage and retrieval is more difficult. New information from sensory memory and knowledge from long-term memory are integrated with information in short-term memory to produce solutions (see Figure 1).

Sensory memory acts like a huge register, retaining large amounts of sensory data very briefly so that it can be processed into a meaningful form, eg to recognise a face, which is transferred to short-term memory. The sensory data is then quickly replaced with new incoming data.

Short-term memory acts like a very small queue with a limited retention period. It can hold only 7 ± 2 items of information, with new items added into short-term memory displacing older ones once this limit has been reached. Items disappear after approximately 30 seconds if not rehearsed. The items of information in short-term memory act as 'pointers' to arbitrarily large and complex pieces of information stored in long-term memory. For example, the seventh of January is one chunk for me (it's my birthday), two chunks to you (one for each familiar word), and 14 chunks for a non-English speaker familiar with our alphabet (one for each character). The number 7 ± 2 may seem rather arbitrary, but experimentation shows it is remarkably consistent across a wide range of individuals and cultures. Short-term memory acts as a workspace for problem solving. The more items that are held in short-term memory the longer it takes to process them.

It is important not to overload short-term memory. Its limited size is a critical bottleneck in problem solving and one of the main constraints to consider for any user interface (designed for human users at least). Don't force the user to try to hold lots of items in short-term

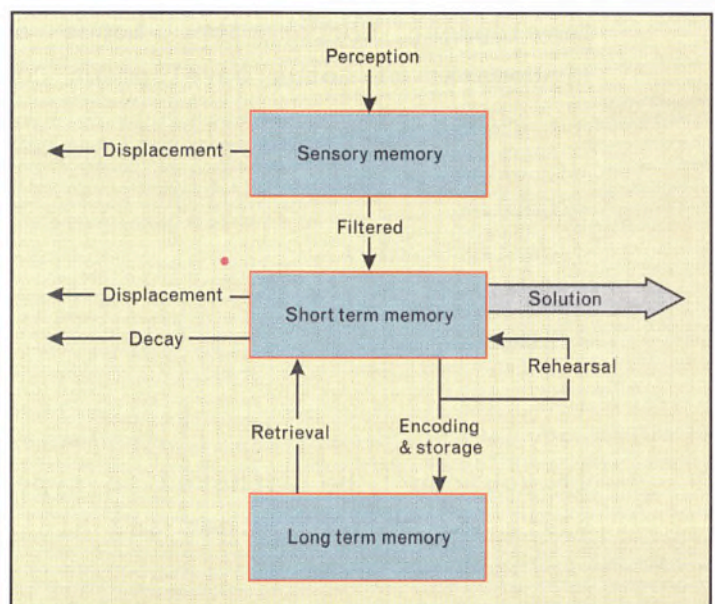
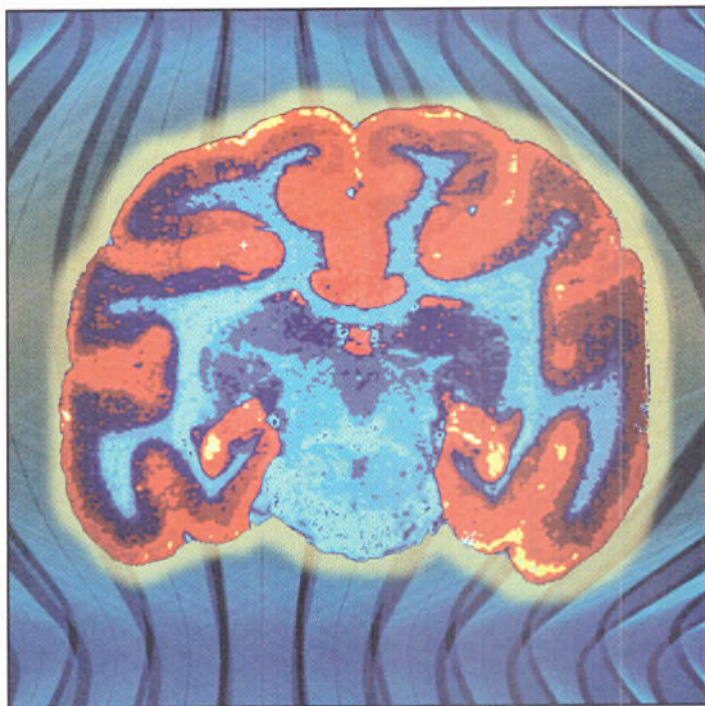


Figure 1 – A simple model of memory and problem solving.



memory. If they have to think about more than 7 ± 2 items, then new items will displace old ones, and the more items that are in short-term memory the slower their response time will be. Having lots of 'open' tasks puts a big burden on short-term memory, so tasks should be grouped into well-defined 'transactions'. Complex tasks can almost always be broken down into simpler sub-tasks.

Long-term memory acts like a huge network database. It has a complex structure and massive capacity, but storing and retrieving information is slow and not always reliable. Items of information are apparently interconnected and accessed by some form of pointer. Some psychologists believe that long-term memory may be permanent, and only the ability to retrieve it may be lost (a bad case of 'dangling pointers' perhaps?). Dreaming may be a side effect of routine re-structuring of long-term memory (garbage collection?) while we are asleep.

Transferring information to long-term memory seems to be a process of encoding the memory and creating pointers to access it. The more often an item of information is accessed the easier it becomes to access in future, and each item of information may be accessible by many different routes. The more context cues that are available the easier it is to retrieve an item from long-term memory. For example, if an item was presented in a particular font, colour, and size, it will be easier to remember its meaning if the same font, colour, and size are used.

LHS values and RHS values

There is some evidence that image and verbal memories are stored in different parts of the brain. We can often remember the faces of people we have met better than their names. Experiments show that it is easier to remember an image than a word. It is also easier to remember a concrete word than an abstract word. For example, 'car' rather than 'transport'. This implies that the iconic representation of commands on toolbars has value beyond just looking nice, and keywords used in a command line interface should, where possible, be concrete rather than abstract.

The different types of memory are stored using different physical mechanisms, probably electrical, chemical and structural. As proof of this you can train an animal to run a maze, cool it down to the point

where all brain activity ceases and then warm it up again. It will have forgotten how to run the maze, but remember things it learnt days before (I don't recommend you try this with users). The transfer of information from short-term to long-term memory, and retrieving it again, is not very reliable. It is better to allow the user to select from alternatives rather than force them to commit items to long-term memory and then retrieve them.

At work, the interface of our old accountancy package had many shortcomings. Projects had to be identified as five digit numerical codes, even though alphabetic codes would have been easier to remember. Users also had to enter project numbers from memory, no facility for selecting from available projects was provided. It wouldn't have taken much effort to produce a better interface design, just a little thought. For example, the Microsoft Word print dialog cues the user as to the permitted format for specifying pages to be printed (see Figure 2).

The sense of vision

The brain gets its input from the outside world through the senses. Of the senses, vision is the most important, with some 70% of all sensory receptors in the eyes. The importance of vision is also reflected in the design of modern computers. Other than the odd beep, the computer communicates with the user almost entirely through the VDU: I will confine this discussion on the senses to vision alone.

The eye is an impressive sensing device by any standards. Tests show that it's possible for a human eye to detect a candle flame at a range of 30 miles on a dark, still night. This corresponds to detecting a signal as low as a few photons entering the eye. The retina contains some 5 million 'cone' receptors and 100 million 'rod' receptors. The cones are sensitive to colour, while the rods are sensitive to brightness. Some cones are sensitive to red, some to green, and some to blue, depending on the pigment they contain. The cones are much more liberally supplied with nerve cells and are able to discern detail, but they don't function in low light levels. They are densest in the centre of the retina, and virtually absent at the outer edge. The fovea centralis, a spot 1 millimetre across at the centre of the retina, contains some 200,000 cones and no rods. The rods only detect light at the blue end of the spectrum, but they are extremely sensitive and can detect a single photon of light.

Because the fovea is so small we are only able to distinguish detail over a range of approximately 2 degrees. This equates to about 2.5 cm at the normal distance from user to VDU. To build up a detailed picture of what is on the screen we have to scan it. It therefore makes sense to have single items on the interface not bigger than 2.5 cm, so they can be recognised without having to scan them. Games and sim-

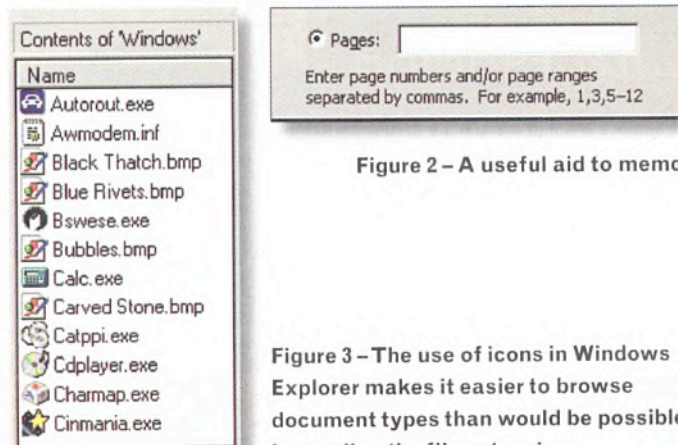


Figure 2 – A useful aid to memory.

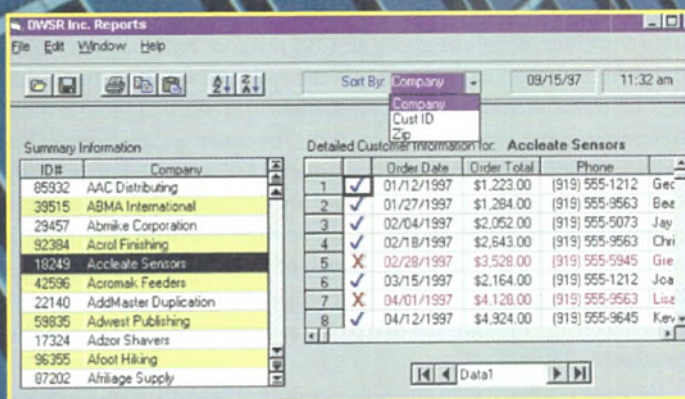
Figure 3 – The use of icons in Windows Explorer makes it easier to browse document types than would be possible by reading the file extensions.

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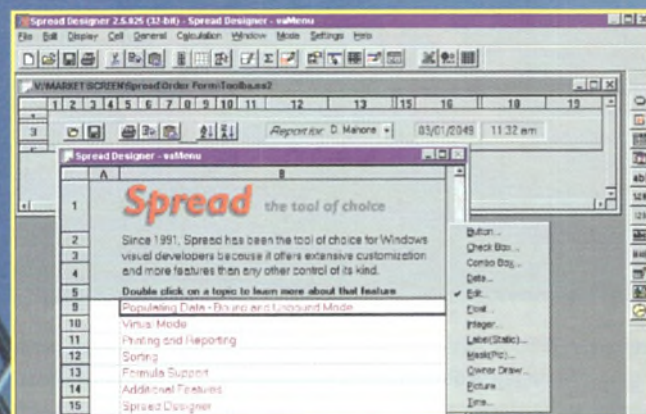
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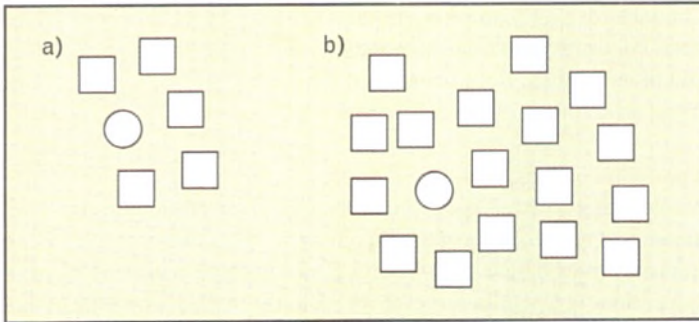


Figure 4 – The anomalous shape that is detected as quickly in (b) as in (a), even though there are three times as many targets.

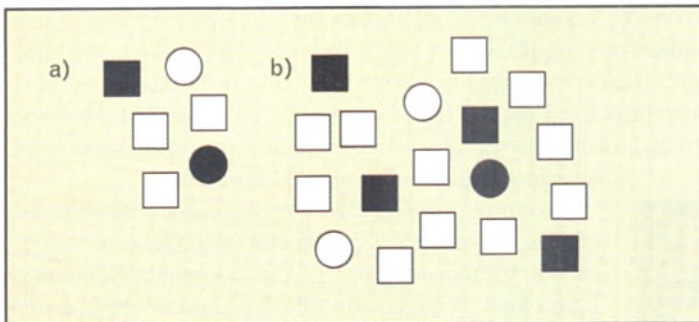
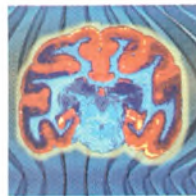


Figure 5 – Time taken to pick out the black circle increases as the number of targets increases.

ulators that perform real-time rendering are wasting a lot of processing power by rendering the whole picture at the same level of detail. What they should ideally be doing is performing very detailed rendering at the point where the user's fovea is pointing and progressively less detailed rendering further away. It is possible to detect where the user is looking by bouncing an infrared beam off their retina. If this technology becomes widely available, it could be used to perform differential rendering, with the result appearing much more detailed without any increase in processing power.

The receptors in the retina, in common with other sense receptors, are only sensitive to *change*. Using special optical equipment it is possible to project a 'stabilised' image onto the retina that does not change, regardless of eye movements. This stabilised image fades to a formless grey, and is no longer discernible, after only two to three seconds. It turns out that the constant movement of the eye, originally thought to be an imperfection of the optical system, is essential for sensing unchanging images. The practical consequence is that any form of movement, animation, change in intensity or flashing, on a user interface is extremely noticeable. Flashing should be used sparingly as it can be distracting and fatiguing to users. Quickly changing text is also difficult to read. This is why, in our digital age, car speedometers remain as analogue dials rather than numerical LEDs. It may be better to put a flashing symbol next to steady text; this draws attention to the text without reducing its legibility. Mosier and Smith (*Guidelines for Designing User Interface Software*, www.syd.dit.csiro.au/hci/guidelines/sam/guidelines.html) recommend a flash rate between 2-5 Hz, with a minimum 'on' time of at least 50 percent. Large flashing areas of colour are believed to aggravate epilepsy and shouldn't be used.

While sensation happens in the eye, perception happens in the brain. The receptors in the retina convert the light to electrical signals, which they pass to the brain through the optic nerve (a bundle of approximately 1,000,000 neurons). The information is processed in



the visual cortex, the surface of the brain at the back of the head. Our perception is incredibly sophisticated, as artificial intelligence researchers have found to their cost. Experiments on the cortex show that it has evolved with built-in 'feature detectors'. A feature detector is a neuron that fires for a very particular stimulus.

As you are reading this page your eye is making rapid movements, with your brain recognising the shape of two to three words at a time before moving on to the next group of words. This is apparently being done by information from different feature detectors being integrated very quickly. For example, the word 'FIX' can be broken down into six straight lines at different positions in the visual field. We are able to recognise this word in about a third of a second, even though the size and font may vary. Shape recognition is therefore incredibly efficient and seems to be one of the best-developed features of our visual system. Tests show that objects can be recognised just as well from line drawings as from colour photographs. A cup is recognisable as a cup because of its shape, not because of its colour, and orientation, etc. Textual representations are not always the best way to convey information; a map, chart, diagram, or other form of image will often convey the same information quicker (see Figure 3).

Tests show that our ability to pick out simple features such as length, orientation, curvature, and brightness are carried out at a very low level, in parallel. Consequently, we can pick out items based on these features in a constant time, regardless of the number of other items in the image. Careful use of these abilities allows a great deal of information to be filtered very rapidly by the user (see Figure 4).

However, the brain is not so good at integrating ('conjoining') different types of feature, for example shape *and* brightness. It is easy to pick out a black icon or a circular icon, but picking out a black circular icon is more difficult and time consuming (see Figure 5).

It follows from this that you should try to distinguish features of the interface by shape or brightness or orientation, but not a combination of these factors.

The visual cortex carries out a great deal of processing that we are unaware of, not least of which is turning the image of the world the right way up. Even though we can understand the nature of illusions, our visual system is still fooled. This is because it is not just sensing the world, but trying to interpret it, making use of all sorts of cues and in-built knowledge, and this is happening at a lower level than we can consciously control. You may not have even noticed that there was a deliberate spelling mistake in the last sentence because your perceptual system made a sensible guess (see Figure 6).

Depth

Although the image projected onto our retina is two dimensional we have very well developed depth perception; our ancestors wouldn't have been able to swing through the trees without it. Partly this is because having two eyes allows stereoscopic vision, but also because

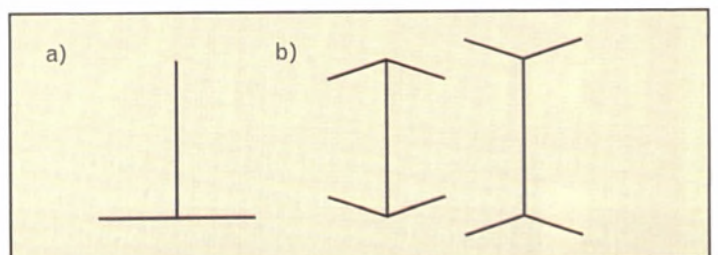


Figure 6 – For (a) the horizontal and vertical lines are the same length. For (b) the vertical lines are the same length.

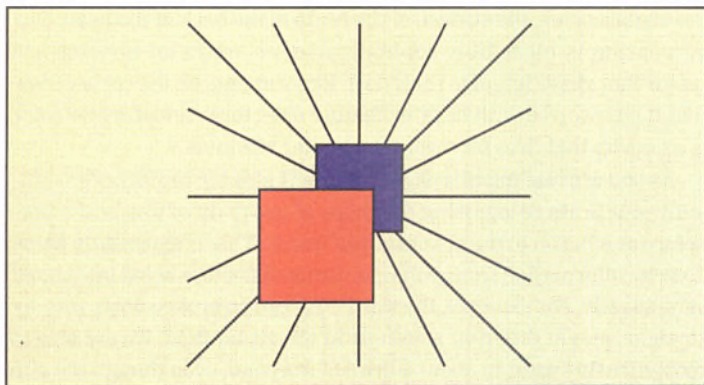
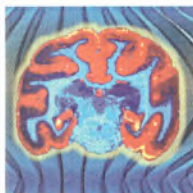


Figure 7 – Use of depth cues make one shape appear closer than another.

our brain processes lots of other visual cues that produce a sensation of depth, even where it doesn't exist (for example in a photograph). The main cues are:

- More distant objects are smaller.
- More distant objects appear closer to the 'vanishing point' created by converging parallels.
- More distant objects move across the visual field more slowly.
- Superposition; if A overlaps B then A must be closer.
- Shadows and highlights.
- Chromostereopsis; long wavelength colours (eg red) appear closer than shorter wavelength colours (eg blue) because shorter wavelength light is refracted more strongly by the lens of the eye (but this is rather weak compared to the other effects).



See Figure 7. Using these cues can give a very effective illusion of depth, without specialised equipment such as stereoscopic goggles. Currently, this built-in depth perception is only taken advantage of in a very limited way in most GUI environments, for example the use of highlights and shadows to infer a three dimensional element for controls. Many applications would benefit from a three dimensional representation. For example, the structure of a complex website could be better presented in three dimensions rather than two. The availability of VRML and other technologies is likely to make three-dimensional interfaces increasingly common.

Interestingly (see Figure 9), it is purely a matter of convention and practise that makes us imagine the light source at the top-left and to see the top button as sticking out and the bottom button as sticking in. You can also see them the other way around if you try.

Layout is an important feature of an interface. Western users will tend to scan a screen as if they were reading a page, starting from the top-left. Scanning can be made easier by aligning controls in rows.

Complex displays can be made easier to scan by adding additional cues. For example, a timesheet could have a thicker line denoting the end of each week. Both layout and similarity can be used to group items on an interface, as in Figure 8.

The colour of meaning

A colour is perceived according to how strongly it activates the red, green, and blue cone receptors in our eyes. From this we perceive its intensity (how bright it is), its hue (the dominant wavelength), and saturation (how wide a range of wavelengths make it up). Within the 400-700 nanometer visible range, we can distinguish wavelengths 2 nanometers apart. Combined with differing levels of hue and saturation, the estimated numbers of colours we can discriminate is 7,000,000. But colour should be used sparingly in interfaces. I once worked on an application where a very extrovert student with dubious taste (as evidenced by his choice of ties) had designed the user interface. Each major type of window had a different lurid background colour. This was presumably to make it easy to tell them apart, but the overall effect was highly distracting.

Colour perception, like everything else to do with perception, is complex. Experiments show that how we perceive a colour depends on the other colours surrounding it. If you look through a pinhole at a sheet of green or red paper, it doesn't appear to have a very strong colour. However, if you put the sheets next to each other and look at them both through the pinhole, the colours appear much stronger. If you want to make a colour highly visible, put it next to a complementary colour. For example, yellow is perceived by red and

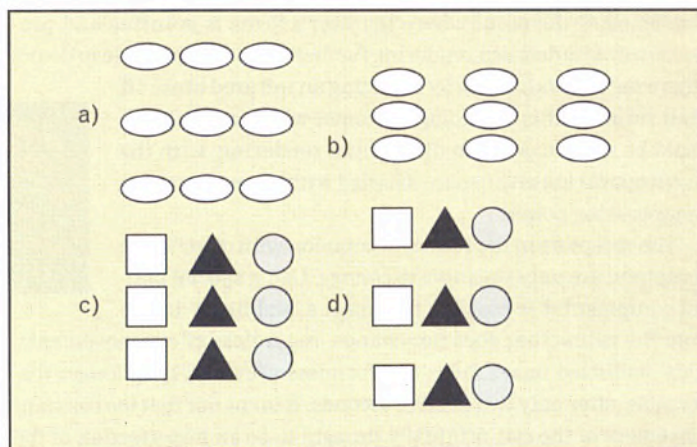
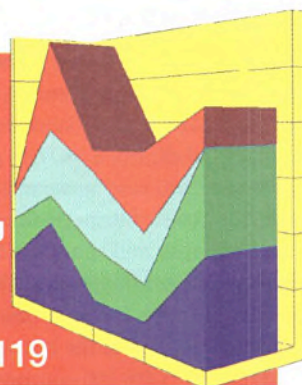


Figure 8 – In (a) the shapes are perceived as 3 rows, while in (b) they are perceived as 3 columns, due to proximity. In (c) the shapes are perceived as 3 columns, due to similarity. (d) gives a mixed message.

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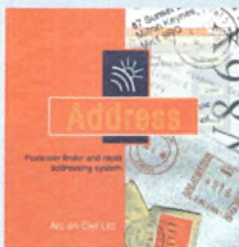
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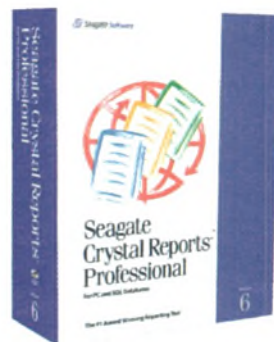
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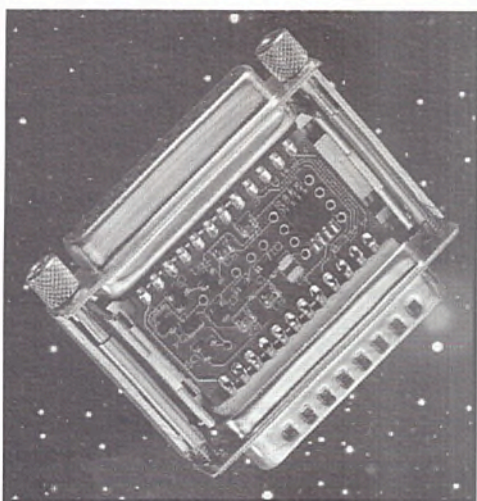
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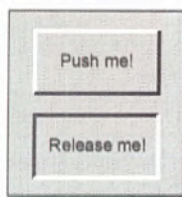


Figure 9 – An illusion of depth.

green cone cells, so to make it more visible put it next to an area of saturated blue.

Colour can be used with text and symbols to add information without making them less legible, as long as a careful choice of colours is used. Some combinations of colours work better than others. Saturated blue appears dimmer to the human eye than other saturated colours and is more difficult to focus on. Blue symbols and text are therefore probably best avoided. However, for the same reasons, blue can make a background that is easy on the eye. Saturated yellow appears brighter than all the other colours for the same intensity.

Designers should remember that a significant proportion of the population has deficient colour vision (some 6% of males and 0.4% of females, the difference being due to the way the defective gene is inherited). This is caused by problems with pigmentation in one or more of the red, green, and blue cone cells in the eye. While there are a range of different types of colour deficiency, the most common is the inability to distinguish between red and green. This raises some questions about the design of traffic lights (some colour-deficient drivers have to rely on the position, rather than the colour, of the lights). Some individuals may not be able to distinguish one or more primary colours from grey; it is therefore unwise to put a primary colour on a dark background. Allowing users to customise colours goes some way to alleviating this problem.

Other forms of vision defect are also common, as evidenced by the number of people wearing glasses. Something that is easily visible on the programmer's 17-inch screen may be almost impossible to read on a user's LCD laptop screen. This problem is further compounded by the fact that eyesight deteriorates with age and programmers tend to be younger, on average, than users. There also seems to be a tendency to use ever-smaller fonts even though screen sizes are increasing. Per-



Figure 10 – Colour combinations.

haps this is based on the assumption that large fonts make things look childish and unsophisticated, so small fonts must look professional. Ideally, the user should be able to customise screen resolution and font sizes.

Meaning can sometimes be conveyed with colour, for example a temperature scale may be graded from blue (cold) to red (hot) as this has obvious physical parallels. However, the

meaning of colour can be very culturally dependent. For example, red is often used to imply danger in the west, but this does not necessarily carry over into other cultures. The relative commonness of defective colour vision and the limited ability of users to attach meaning to colour means that it should be used as an additional cue, and should not be relied on as the primary means of conveying information. Furthermore, colour won't be visible on a monochrome display (now relatively rare) or a monochrome printer (still very common).

Strengths and weaknesses

Humans are good at recognising patterns, making creative decisions, and filtering huge amounts of information. Humans are not so good at arithmetic, juggling lots of things at once, and committing them to long-term memory. Computers are the opposite. A good interface design should reflect the respective strengths and weaknesses of human and computer. Just as a well crafted graphical user interface will minimise the amount of machine resources required to run it, the interface should also minimise the amount of brain resources required to use it, leaving as much brain capacity as possible for the user to solve their actual problem. ■

Andrew Brice is a software engineer with an interest in user interface design and a brain of limited capacity. He works for QuantiSci, a scientific and engineering consultancy, and can be contacted at andy.brice@virgin.net.

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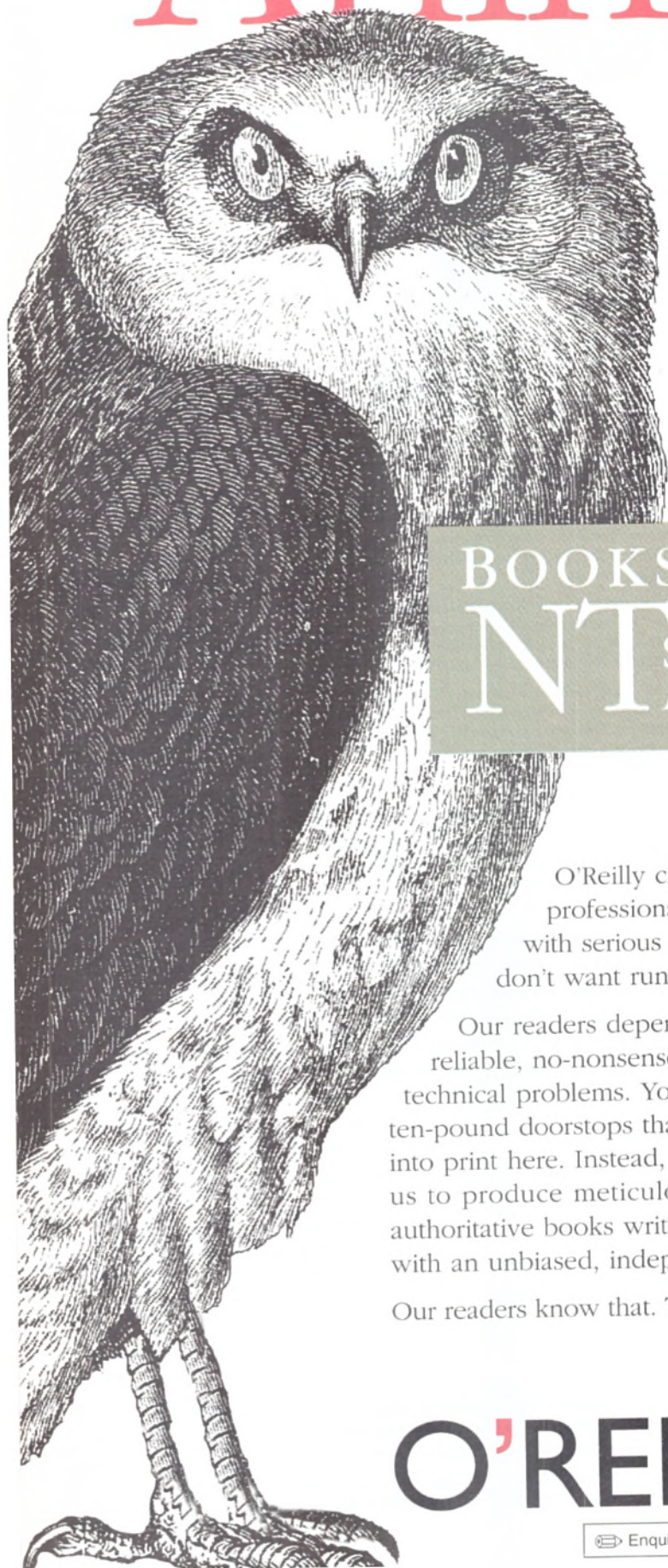
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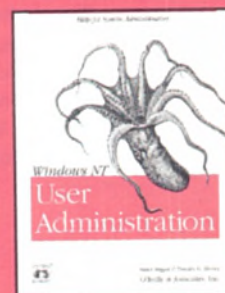
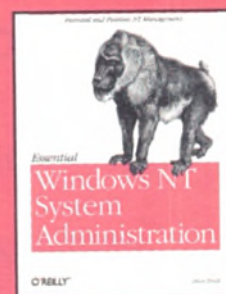
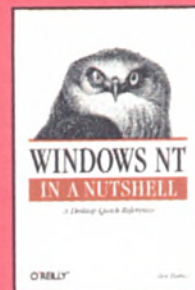
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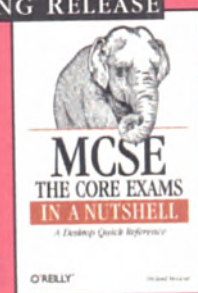
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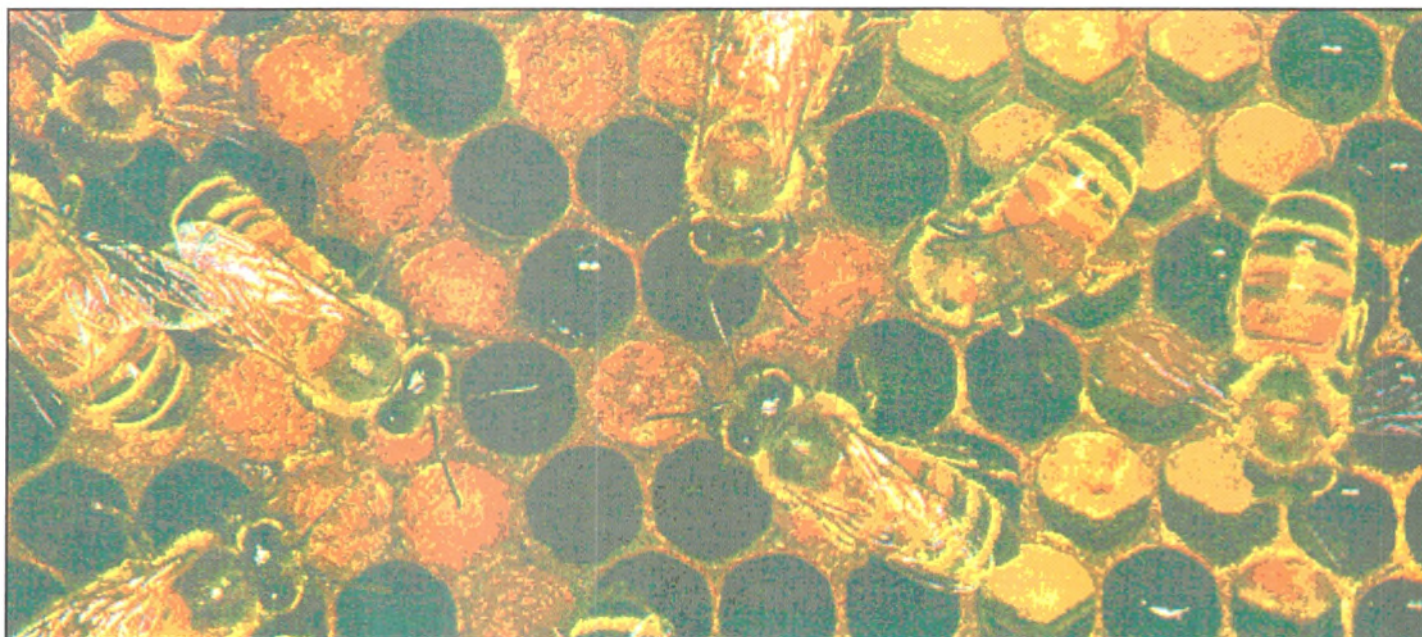
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Creative allocation



Creating data. Do it by destructively editing something that already exists or by creating a new object? Robert Ennals discusses uniqueness typing, a system to save you having to make this decision and which makes programming safer.

Creating new objects is slow, especially if the object is allocated on the heap rather than on the stack. Even when objects are created on the stack or from an optimised memory pool, it is a very expensive thing to do. The object must be initialised and at least some code must be executed to allocate the memory. There is also a limit to how much we can allocate before we run out of storage. Even before we run out of storage, we can run out of physical memory and force the system to perform slow paging. Even small increases in memory usage can cause major slowdowns if they force the working set of a loop to no longer fit in a cache. As a result of these issues, we want to allocate as few objects as possible during our programs.

When we create an object we have a choice of two ways of creating it. Either we can allocate new memory and initialise a new object, or we can change an existing object to turn it into the new object. Take for example a list. We might wish to have a new list that is the same as an existing list, but has one extra member. We might allocate memory for a new list, copy the old list into the memory, and add the extra item, or we might just add an item to the old list and declare that this is our new list.

If we create the new object by editing an existing object, this is going to be a far more efficient way than creating it from scratch. The only drawback is that we have invalidated the object that we edited to create the new one. Anything that previously referred to the old will now refer to the new. Some statements made about the old object will no longer be true.

```
sum = 0
for(int i = 0; i<a.length; i++)
{
    sum += a[i]
}
```

Listing 1.1 – Loop iteration (1).

```
sum = 0
sumb = 0
for(int i = 0; i<a.length; i++)
{
    sumb = sum + a[i]
    sum += a[i]
}
```

Listing 1.2 – Loop iteration (2).

```
sum = 0
sumb = 0

for(int i = 0; i<a.length; i++)
{
    sumb = previous sum + a[i]
    sum = previous sum + a[i]
}
```

Listing 1.3 – Distinguishing object contexts.

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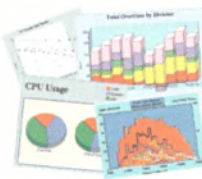
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If we are to destroy an existing object in order to create a new one, then it is essential that there are no external references to the object that is being destroyed. We need to be sure that nothing will attempt to use this object in future and be broken by the fact that we have destroyed the old object by turning it into the new one. Objects to which there are no external references, and thus which will not be used in future, are known as unique objects.

The two reasons for assignment

In general, there are two reasons why one might perform an assignment in an imperative language. The first is that due to the progress of time in an interactive system, the value of the object being assigned to should now be different in order to be consistent with its definition. For example, we might have a variable that contained the current horizontal position of the mouse pointer. As time progresses, the correct value of the variable according to its definition changes and so it is updated to keep it consistent with this definition.

The second reason to assign to an object is to turn it into a different object. The new value of the object is inconsistent with the previous definition of the object. We essentially have a new object being created that takes on the name and physical storage of the old object. In such cases, the only reason for assigning to an existing object rather than constructing a new object with the new value is efficiency.

In one sense, the first is a special case of the second. The value of the position of the mouse pointer at time X is a different object to the value of the mouse pointer at time Y. They are two different objects that happen to inhabit the same storage. Replacing the old value with the new value only works if nothing continues to use the old value.

Intermediate objects

There are many examples of short-lived unique objects that can be optimised away to great advantage. Take, for example, the following assignment:

```
x = a + (b * c)
```

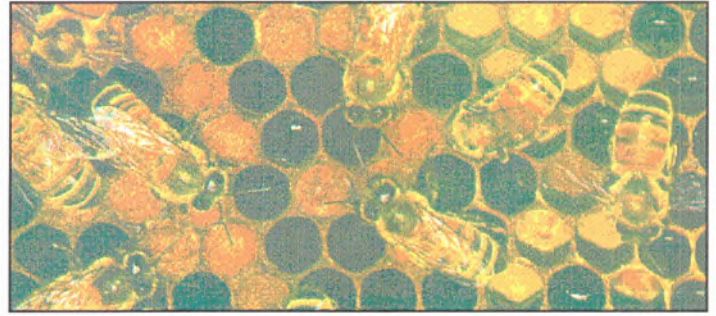
Here one would expect the compiler to create two intermediate objects. It would multiply *b* and *c* to get an intermediate object, then add this to *a* to create another intermediate object, which it then copies to *x*. If *x*, *a*, and *c* are integers then there is little problem here as any good compiler will keep the intermediate values in registers and slowdown will be minimal. However, if the variables are something more complex, such as extra large integers taking up several machine words, or large objects, then the overhead of allocating and initialising temporary objects is likely to become significant.

However, we can observe that we are assigning to *x*, thus the previous contents of *x* are unique: we can use the storage allocated to *x* as the location for our temporary results. We can multiply *b* by *c* and store the result in *x*, then add *a* to this and store the result in *x*. The old value of the content of *x* is unique, and so can be replaced. Once *b * c* has been added to *a* it is unique and can be destructively updated. Consider a more complicated example:

```
x = (a * b) + (c * d)
```

Here we cannot use *x* as the temporary location for all work. If none of the input variables are unique then we will have to allocate at least one temporary. However, if one of the input variables is unique then we can destructively update it to contain the result of one of the multiplications and use the storage occupied by *x* to hold the other intermediate results.

Observe that doing such uniqueness analysis by hand and writing destructively updating code will result in programs that are very hard to understand. As a result, it is better to leave such work to a compiler.



If one does do these optimisations by hand, then one must be careful to annotate code to show what assumptions are being made about the uniqueness of variables.

Loops

The decision to create a new object by editing an existing object is one that we make very frequently, often not realising it. One of the most frequent examples is that of loop iteration.

Consider the code in Listing 1.1. Every time we go through the loop, we change the contents of the variable *sum*. What we are essentially doing is defining the sum of the elements up to *i*, in terms of the sum of the elements before, and storing that in the place where we previously had the sum of the elements before. We are creating a completely new object and storing it where we had a different object before. We are only able to do this because the old version of *sum* is unique. There are no references to it. After the new version of *sum* has been created, nothing attempts to look at the old.

If the old version of *sum* was not unique, then assigning to it would cause problems. Consider Listing 1.2. Here we are trying to sum the contents of *a* into two different variables. The definition of *sumb* intended to refer to the old version of *sum*, to cause it always to have the same value as the new version of *sum*. The old version of *sum* is thus not unique and should not be destructively updated until *sumb* has finished with it. Note that if the line that assigns to *sum* is swapped with the line that assigns to *sumb* then it will still compile but we will

```
// class for singly linked lists
class List
{
    Object head;
    // value for the head of the list
    List tail;
    // the rest of the list
}

class ListTools
{
    List cons(Object head, List tail)
    {
        List node = new List
        node.head = head
        node.tail = tail
    }

    List append(List a, List b)
    {
        if(a==null)
        {
            return b
        }
        else{
            return cons(a.head, append(a.tail,b)
        }
    }
}
```

Listing 2—Appending for non-unique lists.

Develop to... advantage

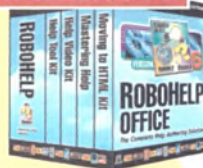
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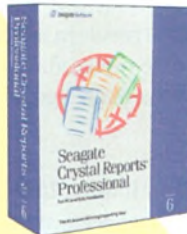
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get different behaviour. It is always a bad sign if changing the order of statements produces a valid, but logically different program.

Listing 1.3 gives a clearer picture of what is going on here. Imperative loop constructs are very confusing as the naming system does not distinguish between the object context of the previous iteration and the object context of the current iteration. Objects in these contexts are logically different objects that happen to inhabit the same storage location. When names of intended objects are explicitly qualified then it becomes much easier to spot destructive assignments to non-unique objects. This version need not be any less efficient as the compiler can spot that `sum` and `sumb` can be destructively updated.

Uniqueness typing

Humans are not very good at deciding whether or not it is safe to destructively update objects. Often it is easy to miss a reference to an object, or the uniqueness of an object depends on the calling functions or the functions called. As a result, it is much easier if the language can do uniqueness checking for us.

The functional language Clean introduces a concept called Uniqueness Typing that makes attempts to assign to non-unique objects impossible. The uniqueness of an object becomes part of its type. By making uniqueness part of the type system, Clean makes life much easier for the programmer. (Information on Clean can be found at <http://www.cs.kun.nl/~clean>. Several documents are available for download, as are several free compilers.)

Clean is a pure functional language. Semantically, one does not change the value of something, instead one creates a new object based on a previous object with some change made, stored in the same storage. Although the new object is stored in the same storage as the old one, it is given a new name to make it clear that we have a logically different object. One does not need to worry about whether or not destructive updates are safe as the compiler proves that objects are unique before destructively updating them.

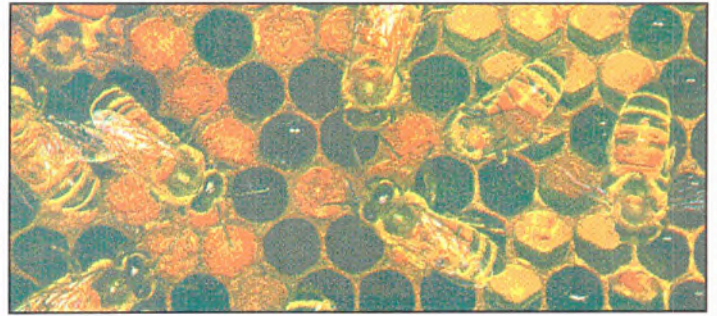
An argument to a function is unique if, at the time the function is called, there are no external references to it. In order for this to be the case, the object must satisfy two conditions. It must have entered the parent function as a unique object and it must not be given as a reference to any other child functions by the parent function. In order to satisfy the first condition of having entered the parent function as unique, the object must either have been created by the parent function, or have been passed to the parent function as a unique object. In order to satisfy the second requirement, the argument must not be passed to any of the other functions called by the parent function, and must not be passed out as part of the return value of the function.

Uniqueness polymorphism

When programming, it is helpful to make our code as general as possible. We would like to be able to write functions that operated on both unique and non-unique arguments and performed destructive updating when arguments were unique. The programmer should not have to know how the storage allocated to an object is being reused.

Consider the example of a list append function. Programmers should not have to rewrite their code depending on whether the lists being appended are unique or not. They should be able to write just one function that logically appended the lists, and leave any destructive updating to an optimiser.

More to the point, a programmer should not be allowed to write different code for handling unique and non-unique objects as that would allow them to create code that did different things. As it is not immediately apparent from looking at calling code which version of



the called code is involved, any logical differences between implementations for unique and non-unique arguments would cause bugs that would be very hard to trace. One would have to prove functions for all possibilities of uniqueness. By forcing a programmer to write one logical definition of a function for unique and non-unique arguments, we make proving code much easier.

It is possible for an optimiser to take a function that logically does not destructively update its arguments and produce destructively updating code when arguments are unique. Define unique and non unique versions of base functions and then decide what should use the storage of what, making sure that only unique objects are destructively updated.

At the simplest level, consider assignment:

`x = y`

If `y` is unique, `x` can reuse the space taken up previously by `y`. However, `y` is not the only object that `x` can use the storage of. If I had another object `z` that was unique, then `x` could use the storage of `z`, even though `x` is not defined in terms of `z`. While the use of `y` by the assignment is easy to do simply by overloading assignment, the use of `z`, which is not an argument, cannot be done simply by overloading and requires work by the optimiser.

Optimisation

An optimiser can perform some quite powerful uniqueness optimisations going beyond those provided by uniqueness typing. Lets return to the previous example of list appending. The programmer might have written a simple definition of list appending to work on non-unique lists, like that given in Listing 2.

Lists are considered here to be single directional. Each node has a pointer to the next node and some data. One can create a new list by using the `cons` function to create a node that is a copy of the first argument and that points to the second argument. The second argument to `cons` is not copied as it is not changed.

```
void Bla()
{
    Thingy x = new Thingy(stuff)
    wobble(x)
    return myFunc(x)
}

Thingy niceX

void wobble(Thingy x)
{
    if(condition)
    {
        // i'll keep that
        niceX = x
    }
}
```

Listing 3 – An object may or may not be unique at compile time.

If the list `a` is not unique then the `cons` of `a.head` to the `append` of the rest of the list will cause a new node to be allocated. However, if the list `a` is unique, the `cons` of `a.head` to the `append` of the rest of the list need not require the creating of a new node as it can instead edit `a` so as to cause `a.tail` to point to the result of `append`.

Up until the last element of the list `a`, all nodes are thus set to point to the same next node that they did before. These destructive updates can thus be optimised away completely.

If list `a` is unique then the function will simply walk the first list until it reaches the last element of the first list, at which point it will destructively update it to point to the first node of list `b`. Nothing will have been copied.

Dynamic uniqueness decisions

We have been talking about static uniqueness typing. However, uniqueness typing can also be applied dynamically.

Sometimes one doesn't know whether or not an object will be unique at compile time. It may or may not be referenced elsewhere. Consider Listing 3. If the condition is true then `x` will not be unique in `myFunc`, but if the condition is false then `x` will be unique in `myFunc`. A static type inferencing system cannot tell us whether `x` is unique.

```
void bla(Blob x= createSomething())
{
    Blip y = wobble(x)
    Blip z = wobble(x)
    x.Release()      // ref count now 0
}
```

Listing 4.1 – Reference counting (1).

The function `myFunc` can do one of three things. First, it can assume that `x` is always non-unique and lose out when it is unique. Second, it can require the implementation of the caller function to call different code depending on whether or not `x` is unique. Finally, it can check whether `x` is unique itself at runtime, for example, by checking uniqueness data stored in `x`. Which it does can be decided by the optimiser, and because the same logical code is used whether `x` is unique or not, it does not affect the logical behaviour of the program.

Being able to dynamically switch between destructive and non-destructive updates can be very useful. Consider the case of a video stream. A sequence of pictures is generated to show animation. Usually, when generating a new frame, the previous frame will be unique and can be destructively updated to create the new one. However, sometimes an application might attempt to grab a freeze frame snapshot of the video stream by taking a reference to the current frame. If there is a reference to the current frame, then it is no longer unique and the next frame must not be generated by destructively updating it.

Of course, one solution to this problem would be for the grabbing program to copy the current frame, but this is very unsafe. If the creator of the frames thinks that the old frame is unique, they may be part way through destructively updating the current frame when the grabber tries to copy it, and the grabber may end up with a corrupted image.

Consider the example of a database that is very large and is updated rarely. Clearly taking a snapshot by copying in this case would be highly impractical. Instead, the system needs to avoid destructively updating records that are not unique, checking their uniqueness at runtime.

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Most of the time, dynamic uniqueness typing will not give performance benefits, but sometimes it can bring very large performance benefits. Deciding when to apply it is hard for an optimiser to decide at static compile time and is best decided either by the programmer or by a dynamic optimiser.

Reference counting

An object is unique if there are no external references to it and thus no other objects that could notice when it gets destructively updated. Unfortunately, conventional reference counting, such as that used by COM, cannot be used to tell us whether an object is unique.

Consider the code in Listing 4.1. We create an object *x* with the function *createSomething*. It is assumed that *createSomething* does not keep any references to *x* anywhere and so the reference count on *x* is 1. Although *wobble* is called twice, once to create *y* from *x* and once to create *z* from *x*, in both cases the reference count of *x* is 1.

The function *wobble* has no way to distinguish between the *x* it was passed the first time and the *x* it was passed the second time. However, the first time it is called *x* is not unique and the second time it is called *x* is unique.

```
void bla{Blob x = createSomething();x.AddRef()
// non uniqueBlip y = wobble(x)x.Release()
// unique
Blip z = wobble(x);
x.Release() // ref count now 0
}
```

Listing 4.2 – Reference counting (2).

We need to provide *wobble* with a way of being able to tell the difference between an object that only has a reference count in order to stop the object disappearing before the function call, and an object that has a reference count because it is actually being used somewhere else.

One way to do this is to say that an object is unique if it has only one reference count and non-unique if it has more (see Listing 4.2). If an object has a reference count of zero then it will have been destroyed and we won't be able to look at it to determine that it has such a reference count.

In order to use this approach one must use additional *AddRef* and *Release* calls to indicate whether an object is to be used later. Doing this produced code that does what is required but that is very difficult to understand, highlighting again the fact that uniqueness type inference is best left to the compiler. Note that even if this approach was suitable, it should not be used in existing systems, such as COM, that attach different meanings to references, especially as interprocess proxies will usually hide reference counts greater than one from the object (so as to avoid unnecessary RPC calls).

To re-emphasise, destructive updates are very useful, but one needs to make sure that one does not destroy an object that is still needed. This is very difficult to do and is best left to a dedicated optimiser that knows what it is doing.

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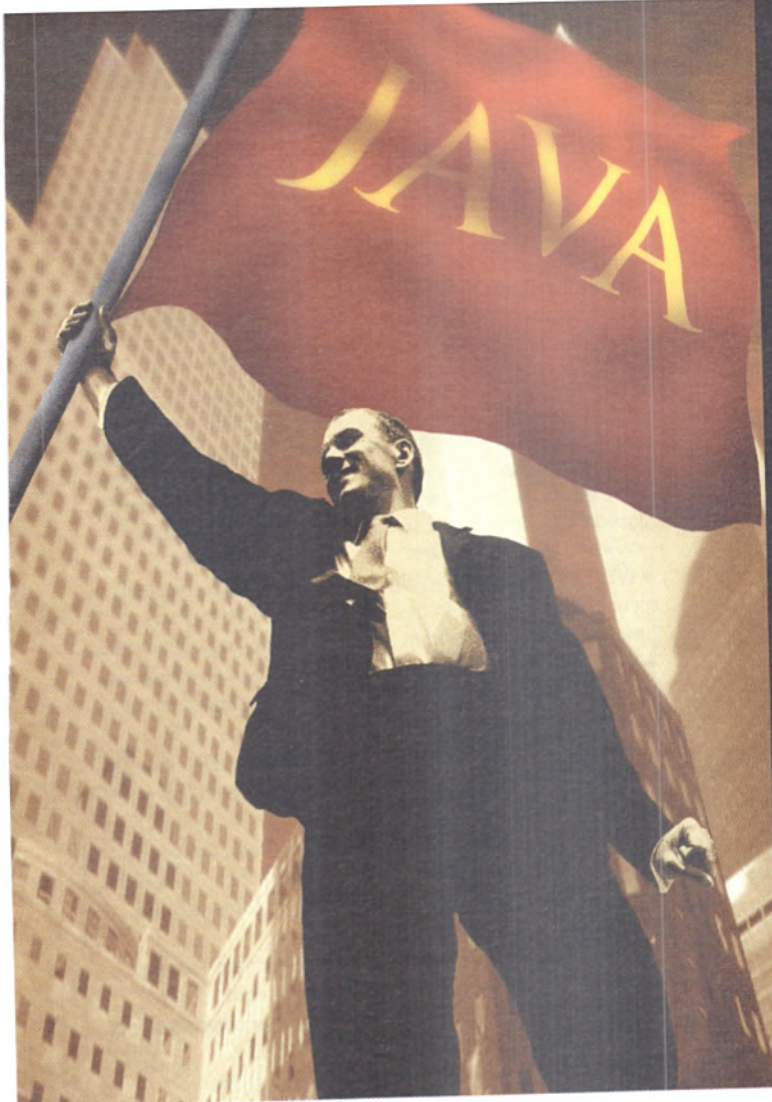
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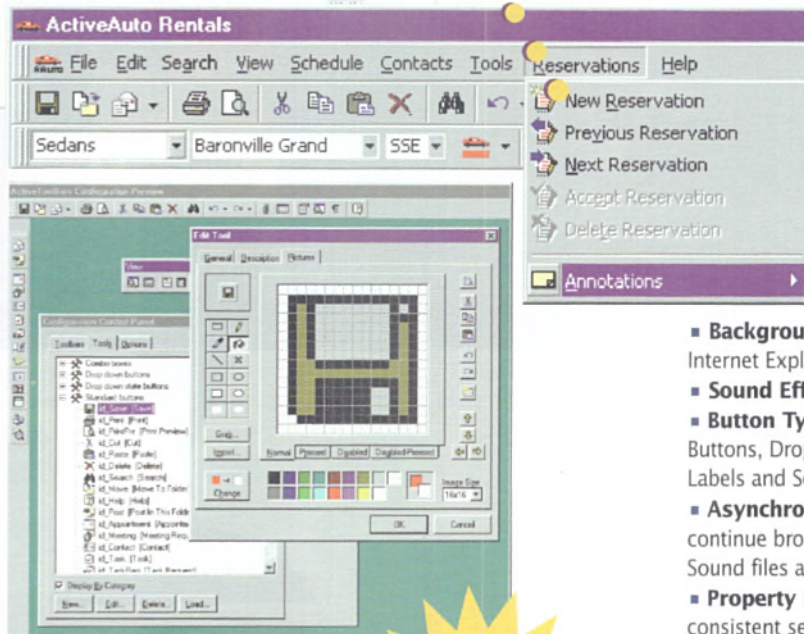
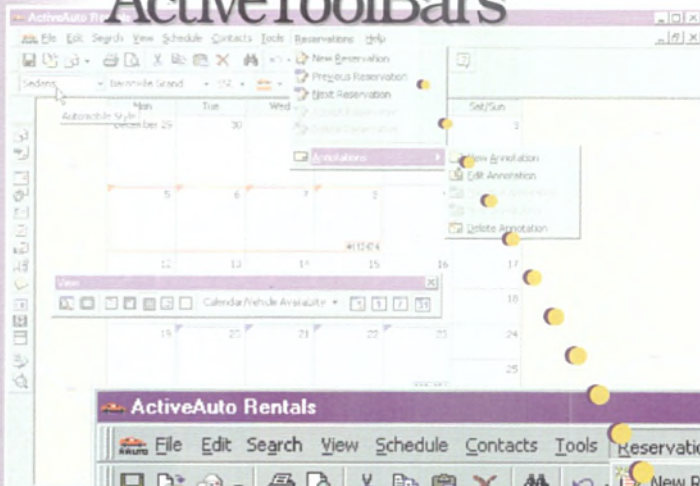
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A hands-off approach to channels

It needn't take a lot of work to keep web channels up to date. Neil Hewitt shows how channels can do it themselves.

Whatever happened to push technology? Two years ago, push was going to revolutionise the Internet. People would have active desktops (or should that be Active Desktops™?), streaming newsfeeds, and countless special-interest channels of information at their fingertips. You'd have to have been living in a cave for the last two years to be unaware that this has not come to pass. One reason was probably that the two main players in this revolution – Microsoft and Netscape – were unable to agree on a standard for these channels, just as they were unable to agree on a standard for Dynamic HTML, browser extensions, or indeed anything at all. Another was that no W3C recommendation for channels was forthcoming in time. The situation was confused further by companies like BackWeb and Point-Cast and their proprietary solutions.

And so it came to pass that when Netscape Netcaster and IE 4.0 finally saw the light of day, many people had lost interest in push technology, particularly Webmasters, who were loathe to spend the time creating and updating one set of channel information, let alone two separate sets for IE and Netscape users. Which is a shame, because channels are actually remarkably simple to do, with a little ingenuity.

Enter CDF

In this article, I will be dealing only with IE 4.0-style Active Channels. I'm sure it's possible to apply the techniques I describe here to Marimba-format channels, but I've never tried. If anyone out there successfully manages it, I'd be interested to hear from them.

Microsoft Active Channels are implemented in CDF – the Channel Definition Format – which is an implementation of the Extensible Markup Language (XML). For more information on XML, I recommend you see Adrian Orlowski's article in the June 1997 issue of EXE. CDF is actually a very simple markup language akin to HTML.

CDF files are organised into *channels* and *subchannels*. Each channel is a top-level heading that will appear in the channel browser bar in IE4, while the subchannels – which can be nested as deeply as you require – appear only when their parent channel is selected. Here's a snippet of CDF that defines a very simple channel:

```
<CHANNEL HREF="http://www.wibble.co.uk/channel.html"
      BASE="http://www.wibble.co.uk/" >
<TITLE>The Wibble Channel</TITLE>
<ITEM HREF="http://www.wibble.co.uk/wobble.html" >
  <TITLE>Wibble Wobble</TITLE>
  <ABSTRACT>Not so much Wibble, more Wobble</ABSTRACT>
</ITEM>
</CHANNEL>
```

Each CHANNEL has a TITLE attribute, which is the descriptive text that appears in the channel browser, and can be given an ABSTRACT attribute, which appears in a tooltip when the mouse is held over the TITLE. The ITEM tag denotes a specific entry within the channel, and takes the same attributes. The BASE attribute in the CHANNEL tag is needed even if all the HREFs are given in full URL form, and it should specify the directory where the files for that particular channel are stored. Each channel, sub-channel, or item may have its own BASE if required. We can amend this code to demonstrate a nested sub-channel, like this:



```
<CHANNEL HREF="http://www.wibble.co.uk/channel.html"
      BASE="http://www.wibble.co.uk/" >
<TITLE>The Wibble Channel</TITLE>
<CHANNEL HREF="http://www.wibble.co.uk/wobble.html"
      BASE="http://www.wibble.co.uk/" >
  <TITLE>Wibble Wobble</TITLE>
  <ABSTRACT>Not so much Wibble, more Wobble</ABSTRACT>
  <ITEM HREF="http://www.wibble.co.uk/
        wibblewobble.html" PRECACHE="no">
    <TITLE>Wobble Wibble</TITLE>
    <ABSTRACT>Even more Wobble</ABSTRACT>
  </ITEM>
</CHANNEL>
</CHANNEL>
```

As you can see, the basic principles of CDF are very similar to HTML, although rather than marked-up text the CDF serves as a guide to the contents of the Web site. If you have a relatively static site – that is, one that rarely changes, or keeps the same structure and page names even if the actual content of the pages changes – then it's very easy to publish a CDF for your site, because it never needs to be rewritten. However, if like the majority of sites your content changes often, adding new pages or replacing existing content with different files, then maintaining the CDF becomes a major headache.

Our solution at EXE OnLine sprang naturally from the basic design of the site. Most of our pages are simply templates, written as Active Server Pages. The ASP code then refers to a database to know what content to place on the page. This makes maintenance a great deal easier because only the contents of the database need to be changed, and this can be done simply with administrative ASP pages from our office or off-site on any computer with Internet access and a Web browser (including my handheld Windows CE machine). I wondered whether this principle could be extended to channels, and as it turned out it can, by implementing a slightly devious trick.

Enter the devious trick

My first thought was to use an ASP script to write the CDF file when the site content changes. This is relatively easy because ASP exposes the Scripting.FileSystem object, which gives you access to the local filesystem. On closer inspection, this idea doesn't work very well, because something has to trigger the execution of the ASP script, which is easier said than done. Also, because ASP must be executed in the context of a browser request, it would require a browser session to be running on the server at all times, which has scary implications for security. Actually, it should be possible to do this with the Windows Scripting Host, but at the time I didn't consider this and I went for a more unorthodox approach.



The ideal solution is to make a CDF file work like an ASP page, with embedded server-side script. As any-

one who has used Internet Information Server knows, ASP code can only be embedded in pages with an .asp extension, and IE 4.0 will not accept any file without the extension .cdf as a channel definition file. The ASP interpreter DLL, however, is actually an ISAPI filter like any other, and as such can be associated with as many file types as the Webmaster likes. In IIS 4.0, this trick is managed by altering the 'application settings' for the Web directory in question, and duplicating the ISAPI association for .asp files with an association for .cdf files. As an aside, it's also possible to pass all HTML files through the ASP interpreter in this way, which is useful if for some reason you don't want people to know you use ASP.

Once this has been done, any CDF file you create on your Web server will be preprocessed by the ASP interpreter when the user's browser calls for it, and you are now free to embed ASP code into your CDF files.

```
<CHANNEL HREF="http://www.wibble.co.uk/channel.html"
  BASE="http://www.wibble.co.uk/" >
<TITLE>The Wibble Channel for <%= date %></TITLE>
<ITEM HREF="http://www.wibble.co.uk/wobble.html"
  PRECACHE="no">
  <TITLE><%= weekdayname(weekday(date)) %>
    's Wobble</TITLE>
  <ABSTRACT>Not so much Wibble, more Wobble</ABSTRACT>
</ITEM>
</CHANNEL>
```

This code puts today's date into the CHANNEL title, and the day name into the ITEM title. Hardly very useful, but it serves to illustrate the principle that a single CDF file can now produce any combination of channel information you require.

As I mentioned earlier, at EXE OnLine all our content is stored in a database and fetched by the template pages as the user calls them. We can use exactly the same tables to populate our CDF file, so that each user requesting the CDF gets a snapshot of the site as it is at that precise moment.

Listing 1 is a simplified version of the EXE OnLine CDF file that contains details of the most recent ten news stories on the site (some of the code has been changed to avoid compromising our security). The structure of the file is quite basic; there is one main channel containing up to ten items. The ASP code relies heavily on principles introduced in my March 1998 article on user registration and authentication, so I would advise you to refer to this if you're unfamiliar with anything that is not directly explained here.

The expression <Item HREF="/redir.asp?page=/news/news.asp?page=<%= news("NewsFileName") %>"> builds the correct link for the news story in question. The TITLE attribute is set to the headline of the news story, and the ABSTRACT to the subheading. The code if datediff("d",news("NewsDate"),date) > 0 checks that the news story or article has already appeared on the site before adding it to the channel, because in our system we often add content to the Web site several days before it actually goes live.

It's important to set the SCHEDULE information for your CDF file if your content is regularly updated. For users who choose to subscribe to the channel, this specifies the interval after which the browser will check for updates to the file. If you leave this out, the browser will continue to use the same cached copy of the CDF until the user manually refreshes it, which defeats the object of the exercise. The INTERVALTIME attribute can be specified in minutes, hours, or days.

```
<%
  set db=server.createobject("adodb.connection")
  db.open("YourDSN")
%>
<?XML Version="1.0" Encoding="iso-8859-1" ?>
<Channel HREF="http://www.exe.co.uk/redir.asp?page=home.asp"
  BASE="http://www.exe.co.uk/">
  <Title>The EXE OnLine Channel</Title>
  <Abstract>The UK's premier software development
    magazine on the World Wide Web</Abstract>
  <Logo HREF="/images/channel1.gif" STYLE="IMAGE-WIDE" />
  <Logo HREF="/images/channel2.gif" STYLE="IMAGE" />
  <Logo HREF="/images/channel3.gif" STYLE="ICON" />

  <SCHEDULE>
  <INTERVALTIME HOUR="1"/>
  </SCHEDULE>

  <Channel
    HREF="http://www.exe.co.uk/redir.asp?page=/news.asp">
    <Title>News (Top 10)</Title>
    <Abstract>The latest news from the software development
      world</Abstract>
  <%
    set news=db.execute
      ("SELECT * FROM EXENews ORDER BY NewsDate DESC")
    count=1
    while not news.EOF and count<11

      if datediff("d",news("NewsDate"),date) > 0 then
%>
        <Item HREF="/redir.asp?page=/news/news.asp?
          page=<%= news("NewsFileName") %>">
          <Title><%= news("Headline") %></Title>
          <Abstract><%= news("SubHead") %></Abstract>
        </Item>

%>

        count=count+1
      end if

      news.movenext
    wend
    news.close
  %>
  </Channel>
</Channel>
<% db.close %>
```

EXE
ONLINE

Listing 1—A simple ASP-coded CDF file.

The other tag necessary for a simple channel like this is LOGO. This specifies the logo graphics that IE 4.0 will place on the channel bar and which you will want to customise for your site. You will need at least three of these; one for the desktop Channel Bar (STYLE="IMAGE", 80x32 pixels), one for the browser Channel Bar (STYLE="IMAGE-WIDE", 194x32 pixels), and one to appear as an icon before each of the items in the channel listing (STYLE="ICON", 16x16 pixels). You can have different icons for each item and sub-channel if you wish by placing a LOGO tag in each one. These graphics will be loaded and cached when the CDF file is refreshed so it's important that the file size is kept down.

Enter your own ideas

The simple trick of making CDF files into ASP pages makes it possible to do some very interesting things with channels, much of which I haven't mentioned here so far. For instance, each user could see his or her own personalised channel, or a different channel according to location.

I plan to cover the topic of database-driven content in more detail soon, but for now, I'd be delighted to hear from anyone who uses, or wants to use, any of the techniques I have described in my articles so far in their own work. You can mail me as neilh@dotexe.demon.co.uk.

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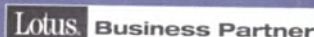
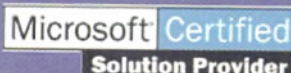
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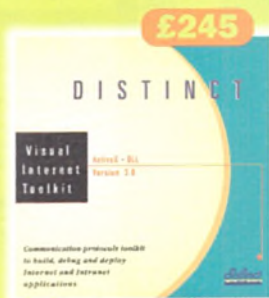
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CodeRush 3.01

The ultimate Delphi fashion accessory?

Dave Jewell reviews Eagle Software's CodeRush, showing just what can be done to enhance the Delphi 3.0 IDE for programming productivity.



Regular readers will know that I'm more than a little keen on the Delphi development system. The reasons for this are many and varied, including the speed of the compiler, the clean Object Pascal language, and so forth. One of the things I most like about Delphi is Borland's so-called Open-Tools API which allows independent developers to load their own packages into the IDE, thereby supplementing the functionality of the development environment.

Such an idea isn't new of course; Visual Basic and Borland's C++ 5.x development system are examples of other programming languages which allow the IDE to be extended. What makes Delphi different is the extent to which you can customise the IDE, even in ways that were not originally foreseen by Borland.

What's the reason for this? Well, you may remember my review of Borland C++ Builder 3.0 a couple of months ago. In that review I mentioned the underlying technology behind Delphi's packages, and explained that the application-package interface is different to a traditional application-DLL interface. Unlike an ordinary DLL, variables can be manipulated across the package interface. Not only can the IDE access variables in the package but – more importantly – the package has direct access to variables and certain routines within the IDE. In other words, there are many more opportunities for clever hackery than would be the case if IDE add-ons were simple DLLs.

CodeRush, son of Raptor...

CodeRush, formerly code-named Raptor, is the ultimate expression (at least, so far) of just what can be done to enhance the Delphi 3.0 IDE. Created by Mark Miller of Eagle Software, CodeRush is comprised of a single large (approx. 1 MB) package and a number of subsidiary 'plug-in' packages. The main CodeRush package provides a set of services (actually, a very rich API) to the subsidiary modules. When you buy CodeRush, you can either stay with the plug-ins that are supplied or, if you're feeling adventurous, you can write (and maybe even sell) your own plug-ins. The CodeRush API is documented in a single large Pascal file, source code for a number of sample plug-ins is provided, and Eagle is working on a complete CodeRush SDK that will provide a number of other tools to help plug-in authors. More on this later.

With CodeRush installed into the Delphi IDE, you can load and unload the various plug-in modules in the usual way. As standard, CodeRush loads with the following plug-ins: Bookmarks, Clipboard-History, File Manager, Hot Files and Hot Folders, Interface Demo, Navigator, Options Dialog, Search Files, Selection Block Markers, Statistics, Tip of the Day, and Tutorial.

In addition to the above, a number of other (mostly free, and some with source) plug-ins are available from the Eagle Software website at <http://www.eagle-software.com>. Plug-ins are generally written with a panel-based interface. In this case, they appear as part of Delphi's Code Editor window. Up to three panels can be active at any one time, and these appear to the left and right of the code editor proper, as well as below it. In addition, you can write plug-ins (such as the Navigator – see below) which aren't Panel based; they simply add a set of buttons to the code editor below the caption bar.

CodeRush in action

This might all sound a bit overwhelming, and one's initial impression (upon first loading CodeRush) is of a very cluttered interface. However, the product has been designed to be highly customisable, and you can swiftly eliminate the plug-ins and panels that you don't want, specify which plug-ins should appear where, and so on. With CodeRush loaded, the right-click context menu in the code editor has been considerably extended, and includes (among other things) a Panels sub-menu. From this sub-menu, there's an entry 'Maximize Code Window', which instantly hides any panels and maximises the size of the code editor work area. This menu option is also available through a hotkey – Ctrl-Shift-F5.

Further flexibility is provided through the 'Show Title Bars' option on the Panels sub-menu. With this option turned on, each panel displays a vertical title bar to the left of its content area. This title bar

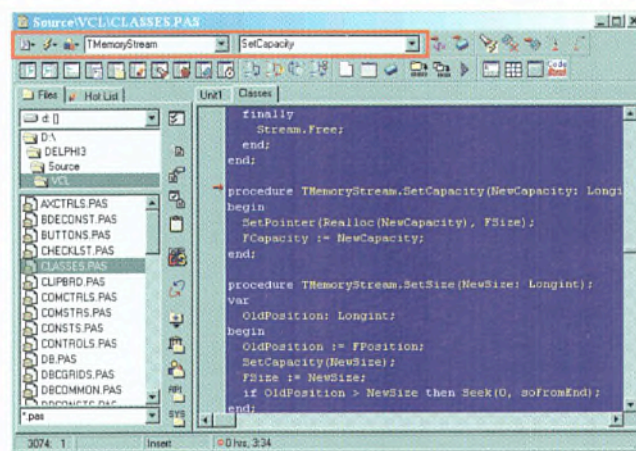


Figure 1 – Here's an example of what your Code Editor window will look like with CodeRush running. The extra pane on the left is the CodeRush File Manager, with the Hot List plug-in behind. Most of the toolbar information below the caption bar belongs to CodeRush itself, with the Navigator's area being highlighted in red for the sake of clarity.

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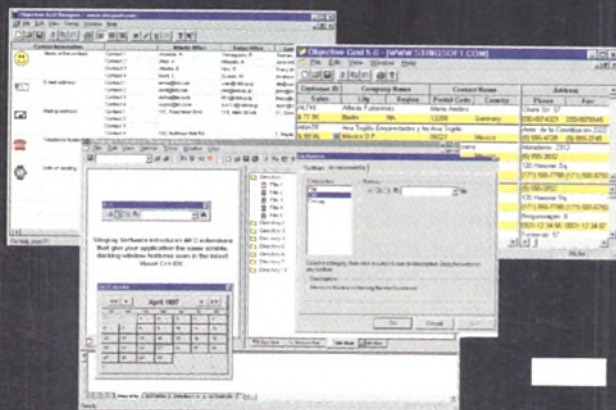
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includes a vertical title for the panel, much like the title stripe to the left of the Windows 95 Start menu. The real significance of this option is the set of buttons that appear on the vertical title bar. These buttons allow you to instantly move a panel between each of the three possible positions or – best of all – undock a panel from the Code Editor, allowing it to float off as an independent window.

Remarkably, CodeRush will even allow you to float off the Message View part of the Code Editor window. This rather surprised me because, after all, the Message View area (where the compiler displays hints, warnings, and errors) isn't a CodeRush plug-in.

A plug-in roundup

What do all these plug-ins and things do for you? Well, let's take the Navigator plug-in as an initial example. With Navigator installed, you'll see a row of buttons and combo boxes as part of the Code Editor window. If you look at Figure 1, I've highlighted the Navigator controls in red for the purposes of illustration.

As the name suggests, the main idea behind the Navigator plug-in is to allow you easily to find your way around inside large Delphi source files with which you may be unfamiliar. The first combo box is used to tell Navigator what Pascal class you want to browse – it's filled with the names of all classes that Navigator can find in the current source file, and there's a separate entry marked 'Classless Methods' for any non object-orientated procedures or functions that are detected. Having set the contents of this combo box, you can then use the second combo box to instantly move the code editor window to a particular method of the given class.

From this, you will have inferred that Navigator parses Pascal source code 'on the fly' in order to build up a list of classes and methods. In fact, the actual parser is located inside the main CodeRush module and is accessible to plug-ins as part of the CodeRush API. For example, there's a routine called `GetClasses` that provides a plug-in with the names of all the classes defined for the current source file, another routine called `GetMethods` that returns all the method names associated with a given class, and so on. In addition, Navigator has three other buttons that can be used to load instantly any unit which is referenced in the `uses` clause of the current unit, to jump to a specific part of the current file (eg start of the interface part, the finalization part, etc), and to jump to specific parts of the current class declaration.

Revenge of File Manager

No, nothing to do with retro-style Windows 3.1 file managers – honest! One of my favourite CodeRush plug-ins is the File Manager. Again, referring to Figure 1, you can see it running in the left-hand window pane, to the left of the normal editor display. The File Manager gives you very quick access to the most commonly needed source directories when programming in Delphi. These are generally the VCL source directory, the Windows source directory, the runtime library System directory, and (if you're into creating Delphi add-ins) the Open Tools API directory. With File Manager running, you can instantly change to one of these directories and display the available files, all with one button click.

File Manager supports the idea of favourite directories. When you click the Favourite Directories button, you get a configurable popup list of favourite directories, each of which can have an associated alias name and a custom filter. Thus, you might stipulate that one directory has a filter of `*.pas;*.dpr` while another has `*.pas;*.inc`. From the File Manager you can also 'touch' designated files, delete them, view and change DOS attributes, and even fire up a DOS box with the directory set to the file location. When double-clicking files in the File Manager,

CodeRush calls the Windows API `ShellExecute` routine to ensure that what happens is what you'd expect to happen if you were 'launching' a particular file from the Windows Explorer. Thus, double-click a `.HLP` file and Windows Help will be invoked, double-click a `.DOC` file and Word will start, and so on. The exceptions to this are the file types that are specifically understood by Delphi, such as `.PAS` files, which are immediately loaded into the Code Editor. If you double-click a `.DPR` (Delphi Project) file, CodeRush will mercifully attempt to load the designated project *without* starting a new instance of the IDE. Compare this with what happens from Windows Explorer:

Boosting your productivity

A big emphasis in CodeRush is the idea of boosting the developer's productivity. This emphasis runs right through CodeRush and other products available from Eagle Software. For example, Eagle supplies a CDK (Control Development Kit) which automates much of the work necessary to create new components and controls using Delphi. It also makes another product called reAct, which automates the process of component testing. Back in CodeRush, there's a Statistics plug-in, which gives you a lot of information on how much benefit you've derived from using CodeRush. It will tell you (for example) how many key-presses you have made compared to how many key-presses you would have made if CodeRush wasn't installed! Based on this ratio, it tells me that my productivity has been boosted by 341.94%. Of course, this is just unashamed marketing propaganda, which has to be taken with a couple of sacks of salt. You can rest assured that once I'd installed CodeRush on my system and figured out what each plug-in did, the Statistics plug-in was the first to bite the dust.

Having said that, there's plenty of reason for asserting that CodeRush does give you a significant productivity boost – although not necessarily one that you can evaluate to two decimal places! Plug-ins aside, there's a lot of productivity-boosting stuff built right into the core CodeRush package. For example, try typing 'ifa' on a new line in the code editor. As soon as you hit the space bar, it will suddenly expand out to:

```
if Assigned() then
```

CodeRush will position the insertion point between the parentheses ready for you to indicate the name of the variable whose assignment

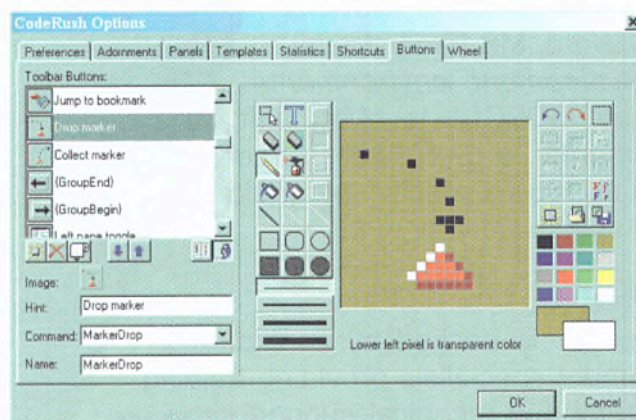


Figure 2 – This is part of CodeRush's main options dialog. From the 'Buttons' page (shown here) you can decide what toolbar buttons CodeRush will display, what internal command should be associated with each button, and you can even edit the button glyphs directly from CodeRush itself.

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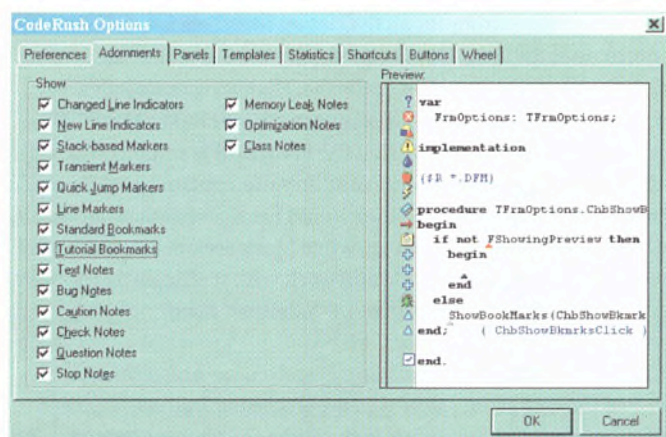


Figure 3 – Here's another page from the options dialog. In this case, you can see some of the numerous types of glyph that can be displayed in the code editor's 'gutter' area.

you're checking. Alternatively, try typing 'one'. This time, when you hit the space bar, CodeRush will display a popup list of possible exception types. Suppose you choose `EReadError`. CodeRush will expand this out to:

```
on e: EReadError do
begin
    ShowMessage(e.Message);
end;
```

In both the above examples, hitting the space bar is the 'trigger' which expands the template. If you find this inconvenient (maybe you actually want to type the word 'one') it's easy to change the trigger key-stroke to something other than a simple space character. CodeRush comes with a large supply of template 'macros', some of which can be quite sophisticated in terms of what gets pasted into the code editor window. According to the documentation, there are over 650 template definitions shipped with CodeRush – but needless to say, I haven't counted them all. Naturally, you can modify the templates, add new ones, delete ones that you don't want to keep, and so on.

My only real whinge here is that there's no on-line documentation at the point where you need it. The Template Editor is completely devoid of on-line help and the Tutorial plug-in only discusses templates in the vaguest terms. Fortunately, the CodeRush manual (I've got a pre-release version as an Adobe Acrobat file, but presumably it will be supplied to purchasers in printed form) goes into a lot more detail here. In fact, this is a general criticism; although I think CodeRush is a great product, it really falls down in this area of on-line help. Much of the time things are reasonably intuitive and you won't miss the F1 key, but from time to time the user interface definitely needs clarification.

In parallel with all these template commands, CodeRush provides a number of built-in commands. You can access these commands programmatically from a plug-in, but you can also add buttons to the main CodeRush toolbar, and assign different commands to each button, just as (for example) you might do in an Office 97 application such as Word. In fact, as with Office 97, CodeRush contains a built-in glyph button editor and (if you're less artistically challenged than me!) you can dream up your own icons for your favourite Delphi commands. In all, there are close to 200 different commands available. Many of them essentially expose functionality that's already present within the IDE such as `ComponentImportActiveX` (import an ActiveX component), `FileCloseAll` (close current project and any open files), and so forth. However, there are many commands that are unique to CodeRush, such

as `PanelShow`, `MarkerDrop`, `BookMarkToggle`, and `BugNoteNext`.

Hmmm...so what's all this stuff about markers, bookmarks, and bug-notes? Well, as you're no doubt aware, Delphi uses the 'gutter' area of the code editor window to display a small glyph for a line that (for example) corresponds to an active breakpoint. CodeRush has greatly extended this gutter usage (some might say, over-extended it!) by supporting many more types of glyph in the gutter area (see Figure 3). Eagle Software refers to these as 'adornments'. By default, as you enter text into the code editor, you'll see small blue 'plus' signs appear beside each new line. Similarly, any line that gets edited will likewise display a distinctive glyph of its own. Typing `Ctrl-Shift-N` will jump you to the next changed/added line, which is obviously handy when altering a large source file.

In addition to the above, CodeRush supports stack-based markers. This is rather like leaving a trail of footprints as you work your way through your source file. As you make changes, you can 'drop' markers at each change location, and then work your way back in reverse order, hence the stack metaphor. Stack based markers are persistent because they get saved in a `.BKM` file when you exit Delphi. Every time you reload a source file, CodeRush looks for a `.BKM` file with the same name.

I mentioned bookmarks and bug-notes. Many different types of bookmark are available, of which the bug-note is but one example. Suppose, for example, that you've identified a bug in a particular routine, but you haven't yet tracked it down to a specific statement. CodeRush allows you to place a bug bookmark alongside a particular source code line, and you can associate a short note with the bookmark. In all, there are eleven different types of bookmark including optimisation notes, caution notes, memory leak notes, question notes, and so on. Once again, you might think this is nothing more than rampant 'feature-itis' on the part of Eagle Software, but if you work in a team-based development environment, such things are extremely useful. Because all these bookmarks are persistent, and are stored in the same directory as the Pascal source, the next person to open the file will see any bookmarks that you've added.

A final testimony

The list of goodies in CodeRush goes on and on. There's a nice file-based search facility, which can be used to search for specific keywords (including regular expressions) in all files with a particular directory specification. There's a 'smart Clipboard' which allows you to store up to nine different chunks of text, locking particular entries so that they're not inadvertently overwritten. There's a Hot Files plug-in to store all your favourite files in instantly accessible folders. There's even a Tip of the Day plug-in to give you a new CodeRush-related tip every time you start the IDE.

But don't let me give you the impression that CodeRush is perfect. It's a complex product and not without a few rough edges. Although the beta programme is now over, and CodeRush is available for purchase, Eagle would be the first to admit that the product is still a work in progress. Registered users will be able to download bug fixes and upgrades as they become available and CodeRush will undoubtedly require some minor tweaking in order to work with Delphi 4.0 when it's released by Borland later this year.

For me, the most irritating bug is File Manager's fondness for resizing the size of its directory and file-list panes every time it becomes active. You'll also find that CodeRush will occasionally cause



a GPF in the Delphi IDE, particularly if you start loading and unloading packages while a code editor window is active – this is something you're specifically warned against. Nevertheless, CodeRush is an impressive product and I can warmly recommend it to any Delphi programmer who wants to enhance his/her programming productivity.

One tip: if you're tempted to buy one of the non-free plug-ins that are described on the Eagle Software website, TypeInsight is the one to go for. TypeInsight is similar to the Navigator plug-in that comes with CodeRush but offers a much faster and more powerful parser. It displays

The CodeRush 3.0 SDK

Although the CodeRush SDK is officially still in beta, you can purchase the beta version now, and you'll then receive the final product free of charge once it ships. The cost of the SDK is \$129 and it's available from the Eagle website. The SDK includes detailed information on the CodeRush API, together with more sample code to get you started writing plug-ins of your own.

The SDK also includes a couple of interesting plug-ins that aren't provided as part of the normal CodeRush package. One of these, RAPIDTools, uses a wizard-style interface to allow you to experiment with the CodeRush API. It's organised as a tabbed dialog with different pages illustrating different aspects of the available API functionality. As an example, the Methods page can be used to interactively 'fire' internal IDE methods to determine what effect they have; if you select Main Application, you'll then see a list of all the available methods supported by the IDE itself. You can then choose one of these and execute it (all from within the RAPIDTools plug-in) to see what actually happens. At the same time, RAPIDTools generates the necessary prototype code for you to insert into the plug-in that you're creating.

To make this clearer, suppose you want to bring up the Environment Options dialog from within your plug-in. To do this, you'd execute the `ToolsOptions` method. This is a method of the IDE and *not* a CodeRush method, but it's accessible through the CodeRush API. By entering this method name into the RAPID Tools 'test-bed', you can execute the method to confirm that it does what you want it to do, and the needed prototype code will be generated for you:

```
CodeRush.ExecuteDelphiApplicationMethod
('ToolsOptions');
```

This can then be pasted directly into your own code.

As you'd expect, IDE exploration and running the IDE on 'auto-pilot' is strongly emphasised in the SDK. Another supplemental plug-in, Form Explorer, can be used to parse the runtime type information associated with any of Delphi's internal forms (and those of CodeRush too!), giving a list of all the components associated with a particular form, as well as the properties of the form and of the individual components. The Form Explorer will even allow you to tweak individual properties to see what happens. Again, this represents a powerful tool for those who wish to undertake extensive IDE customisation in their plug-in.

Of course, this leaves the thorny problem of how to peer inside Delphi's modal dialogs, such as the aforementioned Environment Options dialog. Since the dialog is modal, it's impossible to give control to the Form Explorer while the dialog is active. Or is it? The cunning Mark Miller has thought of that too. The SDK includes a special application that acts as a sort of 'remote control' for Form Explorer. With the remote control, you can invoke Form Explorer, start a modal dialog, and then switch over to the remote control application from where you can get Form Explorer to take a 'snapshot' of the modal dialog. Very cute!

a tree-structured hierarchy for all the classes in a given file, and you can 'drill down' to individual classes, methods, and variables, navigating instantly to the correct location in the file. Highly recommended.

As a final testimony to the usefulness of CodeRush, Mark Miller (the program's creator) told me that the main unit is some 27,000 lines of code! I wouldn't recommend that anyone routinely work with source files of this size, and neither would he. Nevertheless, as we all know, things have a habit of just growing! Mark reckons that he's only able to maintain this source code and work with it efficiently through using the navigational capabilities in CodeRush itself.

Dave Jewell is a freelance consultant, programmer, and technical author specialising in low-level systems programming, development systems, and compiler design. He is the author of 'Instant Delphi' published by Wrox Press. Contact Dave as Dave@HexManiac.com. You can order CodeRush for \$199 with your credit card using a secure on-line connection to the Eagle Software website. For more details, point your browser to the CodeRush area at <http://www.eagle-software.com/coderush.htm>. There are plans to make CodeRush available for distributors in the UK. Again, you can get more details from Eagle by emailing sales@eagle-software.com.

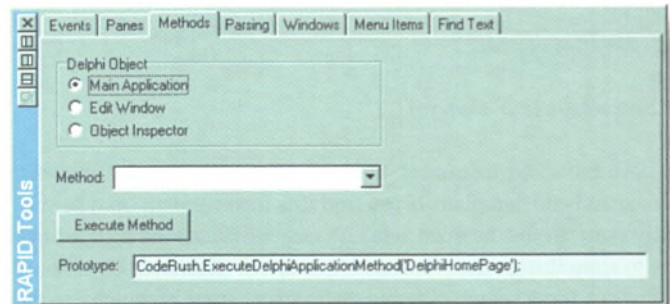


Figure 4 – RAPIDTools is one of the supplemental plug-ins that ships with the CodeRush SDK. Using this screen, you can choose the object you're going to tweak (overall application, edit window, or object inspector), get a list of callable methods for that object, and then experiment with seeing what each method does.

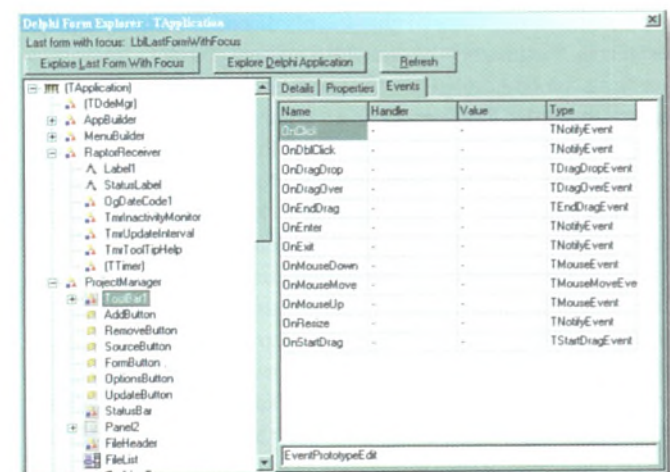


Figure 5 – Again, part of the SDK, the Form Explorer allows you to do all sorts of unspeakable things with the internal forms in both Delphi and CodeRush. You can get a list of components, a list of defined event handlers, view all the properties for a specific object, and even tweak properties on the fly to see the effect that's produced.

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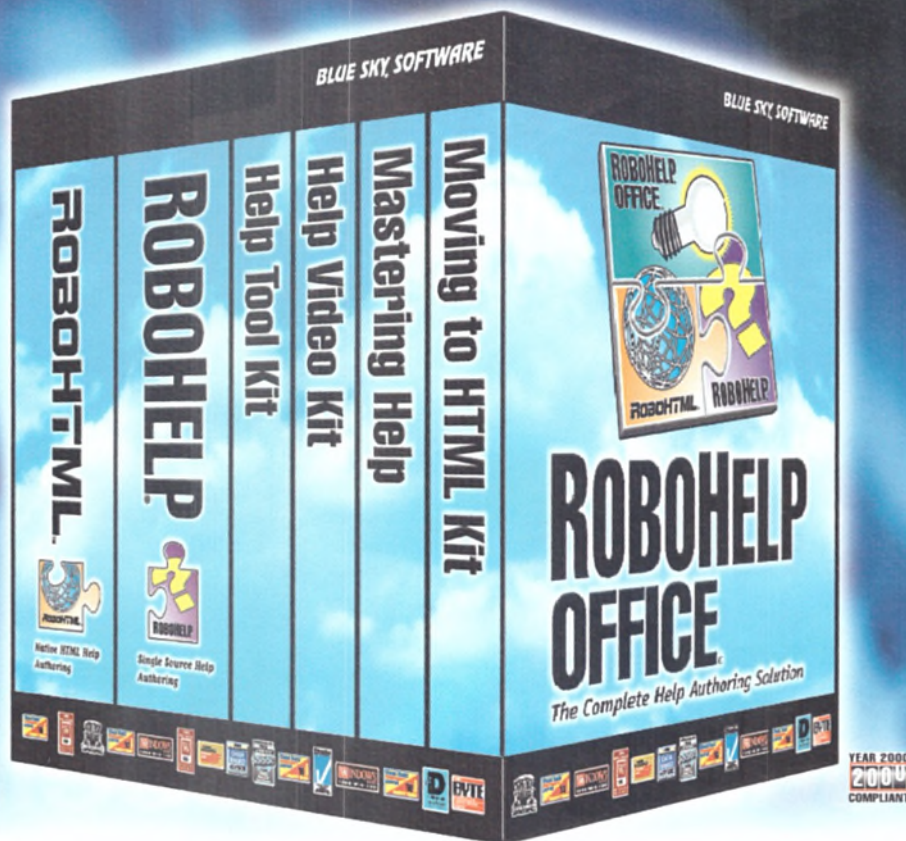
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Samba across the network

Originating in Australia, this suite of publicly available Unix programs provides networking access from Windows. Peter Collinson gets into the swing.

As a Unix hacker, the ability to share files over the local area network has been part of life for aeons, or so it seems. It's always been wonderful to be able to hop seamlessly over to the disks on another machine and access files with no fuss. Windows systems were an exception to this convenience until I installed the network file system (NFS) on the first Windows 3.1 machine that appeared on my network. I seem to remember that I needed a special setup on the machine, because the NFS code was large and interfered with one of the machine's main applications (at least, a primary activity for one member of the family): playing games.

Then came 32-bit Windows, launched as the panacea to the ills of the world. Without a doubt, things on Windows systems have improved, become easier, and become different from what was there before. I now have a Windows NT system as a main part of my working environment; I use it mostly for web browsing and picture creation using various tools. We also have a large Windows 95 machine that has become the centre of my son's activities, since you need large expensive machines to support the sound and graphics integral to the games that he favours. And I've got Windows 95 on my laptop, although today I am running BSD/OS Unix on the machine. I switch using the simple expedient of replacing the hard disk. This document is being created on the laptop while I am away for Easter, and the machine is running Unix largely because that's the easiest way to pick up all the family's email while retaining the privacy that email needs.

Supporting several Windows machines on my network would be very painful without some way of sharing files. As I said, there are NFS stacks for Windows, but recent Windows systems are already supplied with a standard way of file sharing over the network, and it makes sense to be able to use that system to access files on my Unix disks. Into this breach leaps Samba, a suite of publicly available programs that provide the mechanisms needed on Unix systems to support networking access from Windows.

Samba's been around for some time, originating in Australia, but now maintained by many people all over the world. The excuse for this article is the publication of a book that describes the system: *Samba: Integrating Unix and Windows* by John D Blair, who is part of the Samba development team.

What is Samba?

Samba consists of two main daemons that run on the Unix machine, and a small set of ancillary support programs. The first main program is `smbd`, which provides server support for client machines that wish to access files on the Unix machine. The second daemon is a name server, `nmbd`, which provides the necessary name service support for the networking system. The main ancillary program is a networking client called `smbclient`. You can run the program on your Unix machine to access shared files on the disks of Windows



Patricia Deardorff

machines. It behaves rather like the standard FTP program, and so is perhaps not quite as easy to use as you might like. If you run Linux, you can employ a mountable file system that permits the Linux machine to access remote files as part of its tree structured file system. I've been looking for similar client systems that would provide file system access from my Sun or BSD/OS systems, but one hasn't appeared yet, although there's a system called Rumba that might do the trick. I looked at it some time back; it's aimed at the

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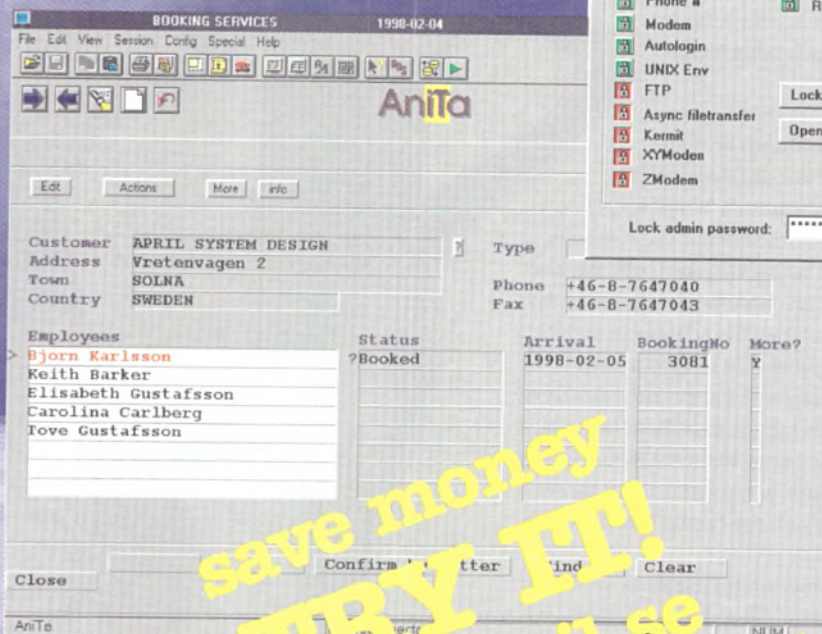
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Getting things

Samba is available on the Internet from <http://samba.anu.edu.au>, although you are advised to go to a local mirror to pull the code. The code is also available on the CD that comes with the book *Samba Integrating Unix and Windows* by John D Blair, published by SSC, ISBN 1-57831-006-7 (\$29.95), <http://www.ssc.com/ssc/samba>.

NeXT operating system and Linux, and it needed work to make it turnkey onto my Unix flavours.

Samba implements the SMB protocol (SMB stands for Server Message Block) that is implemented on top of the NetBIOS API. NetBIOS started life on machines running PC-DOS and MS-DOS, and has matured into three main flavours. First, there's NetBEUI, designed originally by IBM for its LANManager server, and taken up by Microsoft. There's NetBIOS over IPX, developed by Novell, who used IPX as the main transport for its proprietary networking system. Finally, there's NetBIOS over TCP/IP, which was originally proposed in RFCs 1001 and 1002. It's this last flavour that Samba uses.

SMB defines a datagram format that is used to send messages. The protocol is complex because it allows the definition of extensions that have grown over the years as Microsoft has changed its operating systems. Part of the setup of a connection is the negotiation of the flavour of SMB that each party is willing to support. The negotiation copes with backward compatibility, while allowing new systems to use new facilities. In the documentation that comes with Samba, Andrew Tridgell (the original creator of Samba) says:

'This means the protocol is very "rich", offering many ways of doing each file operation. This means SMB servers need to be complex and large. It also means it is very difficult to make them bug free. It is not just Samba that suffers from this problem, other servers such as WinNT don't support every variation of every call and it has almost certainly been a headache for MS developers to support the myriad of SMB calls that are available.

There are about 65 "top level" operations in the SMB protocol (things like `SMBread` and `SMBwrite`). Some of these include hundreds of sub-functions (`SMBtrans` has at least 120 sub-functions, like `DosPrintQAdd` and `NetSessionEnum`). All of them take several options that can change the way they work. Many take dozens of possible "information levels" that change the structures that need to be returned. Samba supports all but 2 of the "top level" functions. It supports only 8 (so far) of the `SMBtrans` sub-functions. Even NT doesn't support them all.

Samba currently supports up to the "NT LM 0.12" protocol, which is the one preferred by Win95 and WinNT 3.5. Luckily this protocol level has a "capabilities" field which specifies which super-duper new-fangled options the server supports. This helps to make the implementation of this protocol level much easier.'

As you can see, Samba talks the latest protocol variant. It can also 'degrade', allowing it to talk to older systems. There are many variants of SMB, but only five main ones. The *Core* protocol was defined in 1987 and specifies a simple client/server file sharing and

printing protocol. *Core Plus* arrived a year later and extended the protocol slightly, mostly permitting more complex requests to be sent in a single message. Lan Manager 1.0 was an extension to the *Core Plus* protocol intended to support OS/2. It included the ability to have more than one networking session open at any one time, and a richer set of authentication options, including encrypted passwords. Lan Manager 2.0 added support for long file names, and reduced network load by implementing more complex commands. Finally, we arrive at NT LM 0.12, which provides support for Windows NT, including new encryption policies, 64-bit file offsets, support for Unicode, and NT error results.

Into the future, Microsoft has proposed an extension of SMB, becoming the Common Internet File System (CIFS), and providing standard access to files over the Internet. The protocol is similar to NT LM 0.12 with some of the redundancy removed, and with added support for Unix symbolic links. (Blair notes in his book that the current specification of CIFS is not complete; it doesn't contain

all that is needed to get a server running.) Windows networking has matured with the various operating systems that were expected to use it. The main design aim has been to allow the creation of simple clients that can access a complex server over a slow network.

Samba allows access to all the features of the basic protocol, and is actually considerably more 'tailorable' than any Windows installation. Samba exports the control of all aspects of the protocol (and its associated name resolution) to a configuration file. The file contains text statements and is trivially editable.

However, the configuration file does present the Samba installer with a bunch of choices that are sometimes hard to make when presented with the extant Samba documentation. In the documentation, the keywords in the configuration file are presented alphabetically, which is fine for reference purposes, but less fine when you are trying to understand what options you need to supply. John Blair's book does help you here. He presents the options in functional groups and explains what each option can do in your installation.

Browsing

The Samba `smbd` client does all the business of transferring files and providing print services. However, there's another part of the SMB networking system that needs to be coped with, and this is the management of names in the SMB name space. Names are distributed as browse lists supporting the 'Network Neighborhood' box on your Windows workstation, permitting a point and click interface to be used to select a service.

The earliest SMB systems used the notion of a workgroup to permit sharing of resources. This is simply a name that all the machines subscribe to. The workgroup is limited to a TCP/IP subnet because some communication is done using broadcast packets, and broadcast packets stay inside a local subnet. Windows NT has extended the idea, creating NT domains. These are slightly glorified workgroups that define an administrative entity, a set of machines on a network that share the same resources. If you have one wire and a small set of machines, like I do, then you don't really need the idea of NT domains and can get by using the notion of workgroups to run your systems.



The browse list for a workgroup or an NT domain is maintained on a machine called the master browser. Although NT domains will have a backup browser, Samba cannot operate as a backup browser because Microsoft has not released the protocol that is used to replicate information between master browsers. There is work going on to reverse engineer the protocol, looking at packets as they fly by on the wire, but the system is not yet fully operational. If you have a Windows NT server on your network, then you should allow that machine to manage the domain.

Whenever a computer comes online offering a service for the first time, it broadcasts an announcement packet telling the local network about the services that it offers. This may include the possibility of becoming a new master browser. If this is the case, an election is held between all the possible master browsers to decide which machine should run the namespace. The election is biased to favour any machine running NT server or workstation. Samba does permit you to have access to the values that control how the Unix platform will participate in the election, which means you can make a particular Samba server win (or lose), should that be desirable. Actually, the default setting means that Samba will always lose.

When a new master browser comes online it will interrogate all the hosts in its browse list identifying the services that they can support. There are very long time delays involved here. It can take a long time (up to 45 minutes) before it can discover that a service isn't available because a particular machine hasn't responded.

The master browser is also responsible for communicating with other NT domains that it can see, and this allows the network to span TCP/IP subnets. Currently, subnet spanning only works for NT domains and not for workgroups. Because this is complicated and covered in some depth in the Blair book I will skip over the topic here.

To get around the restrictions that broadcast packets will only work on a local subnet, the RFCs that defined NetBIOS over TCP/IP defined some possible methods of resolving names. These have matured into the Windows Internet Name Service (WINS) which is a dynamic name service allowing hosts to register themselves when they come online and remove themselves as they leave. Samba can provide WINS support but lacks the replication code that is proprietary to Microsoft.

Authentication and security

If your TCP/IP network is connected to the Internet, then you need to be worrying about security. Can someone enter over the net and raid your filestore? Well, Samba can be set up so that it will only respond to certain IP addresses. Assuming that you have taken steps to stop packet spoofing across your IP router, things should be safe. I have a suspicion that, in this respect, Samba is more secure than any Windows platform you may be running.

SMB has various levels of security that may be imposed. I tend to run my system with 'user level' security, meaning that Samba will authenticate the user and then run a session as that user to access the service on the machine. This seems to work fine when I access the system from my NT workstation; I log into the NT machine and I am allowed access to services supplied from Samba on my Unix machines without having to supply further passwords. On Windows 95, I have things set up so that I am asked for a username and password whenever a new session is started to the machine running Samba.

Samba can use three different types of user authentication. First, it can use the native Unix password file to authenticate the user. The disadvantage here is that the password is sent over the network in plain text, and could be sniffed by a snooper. The second method is to use a DES encrypted password stored in a special file. In this case, the password will be sent encrypted over the network. Recent service patches for both Windows NT and Windows 95 have enforced the use of encrypted passwords, but their use is controlled by entries in the Windows registry and can be suppressed should you wish to. It's probably better to use this method, if running a separate password file for your users is not too painful. Finally, if you have a version of Windows NT server running on your network, then you can get Samba to use the authentication services provided by the NT system. You are advised to use this method, if an NT server exists.

On the Unix machine, Samba will use the standard Unix security mechanisms to control access to files. The invocation of the `smbd` daemon will be run with its effective uid set to that of the user. Again, things are safe because Samba cannot deal with files on the file system to which the user is normally denied access. If you are sharing files between several users using Unix group access, then you may need to experiment to enable users to read and write files without being denied access. You can establish group access to files, and can dictate the file mode that is used to create a new file. However, the SMB network has no good direct mapping between the MS-DOS file permissions and those supported by Unix. One trick to smooth the path is to supply different services with different access rights to the same set of files.

Other standard features

Samba can offer any printer that is supported by your Unix machine as a service on your network. In general, printing is done by spooling a temporary file and invoking the standard Unix print command. Samba can also offer the name of a printer to Windows 95 allowing the system to adapt properly. It can offer a downloadable printer driver should this be needed. I've not tried any of these systems; my laser printer is already plugged into my Ethernet - all the Windows machines talk to it direct (actually, I plug the Windows 3.1 machine into the parallel printer port on the same printer). I do have a colour printer, but that's attached to a Windows 95 machine anyway.

Recent releases of Samba can support the Windows 95 domain logon, providing per user system tailoring and centralised shared files and profiles. Again, I haven't tried this.

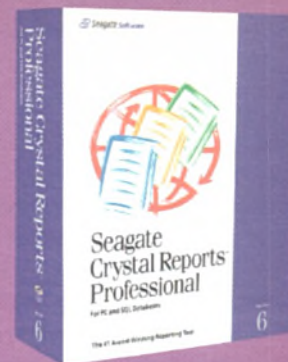
I continue to find it amazing that Microsoft doesn't understand the need to backup machines. The only standard way to backup a Windows NT or 95 machine is to buy a tape drive for each system and run the backup program on that machine. Okay, I could go and buy licenses for the Legato backup system that I run on my Sun, but I consider that the option is too expensive and I've resisted it. I ensure that any important file is actually stored on some Unix file system somewhere, and all my Unix machines can use the same DAT tape drive to back things up.

Samba does provide a client program that can be used on a Unix machine to create a `tar` tape archive from files stored on remote shared file systems. I suppose that I've not used this because it's not



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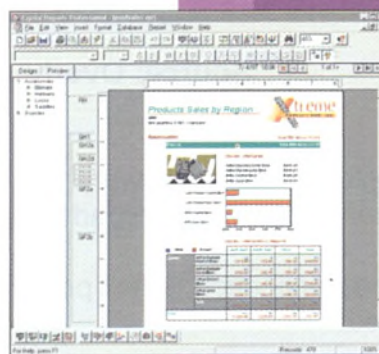
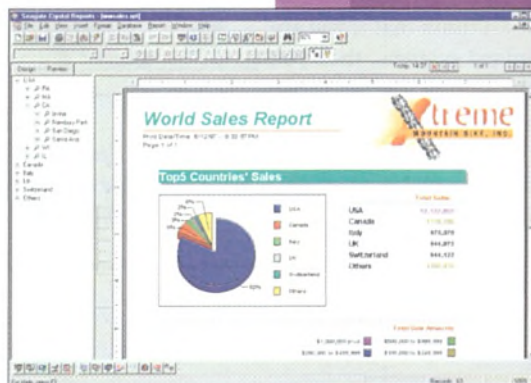
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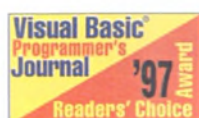
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clear to me that restoring from such a dump will work properly. Sure, you can get your data files back, but if I have a disk disaster I want to put the machine back as if the disaster had not occurred. I cannot store the registry on a tar dump, so I am not really in a position to recover the original setup of the machine from the dump. Realistically, with Windows, a disaster will mean reloading everything – backing all the files up is just a waste of time and energy.

The book of Samba

Well, I certainly have been running Samba without the benefit of the book for some time. I think, however, that the book has given me a greater understanding of how things work and how I should have Samba configured on my network. I will be making changes here. For example, I often get 'disk full' messages from very empty file systems that I am accessing using Samba. I think I can stop the messages by instructing Samba that it should tell clients that the maximum filesystem size is one gigabyte. Windows will believe the lie and be less confused. I think that if you are running Samba on a site with mixed systems, then you will learn a lot from the book, information that isn't obvious from the extant Samba documentation.

The book is easy to read, and reasonably laid out. Some of the book design decisions are curious; paragraphs and sections seem to march rightwards across the page in a somewhat random fashion. There are

places where it's evident that the book has only really been proof read by people with a good grasp of the material, which means no one has discovered the surprises and explanations that don't work too well. First, there is some repetition, largely because the organisation of the material is sometimes not good enough (probably because the author is too close to it).

Repetition can be fine, if a new explanation from a new viewpoint is being given, sadly this does not often seem to be the case. Second, there are some places where knowledge is taken for granted, 'of course you know this', when the topic is explained in more detail a few pages further on.

I question the need for the eight pages that give the various options that are needed in the Makefile to compile Samba for your platform. This material is covered very well in the Makefile itself and is just a waste of space in the book. Actually, when I first got the book, it fell open in this section, and I fell into Tellytubby language: 'Uh oh'. However, the book is generally much better than this first impression suggested. As I've said above, the sections on the basics of SMB, the configuration options, and the sample setup sections seem very good. I would certainly buy this book had I not been given it for review. ■



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

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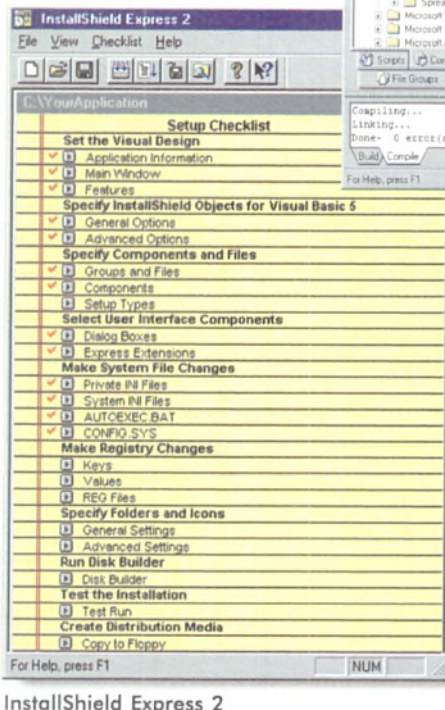
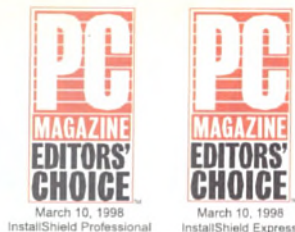


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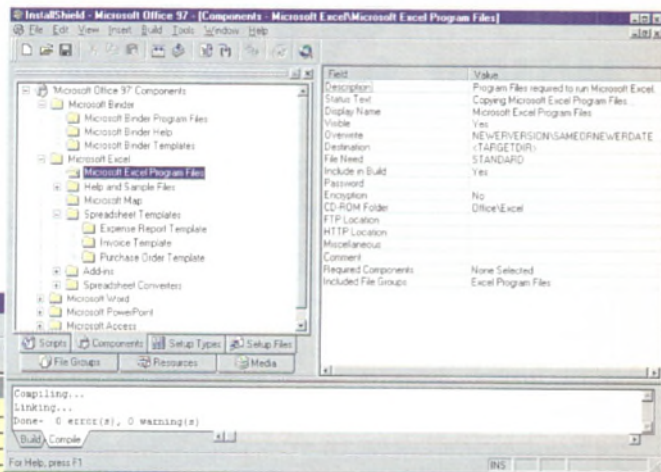
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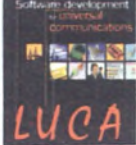
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More than syntactic sugar

Francis Glassborow considers how the reference type represents a significant change that has gradually permeated the grammar of C++.



When I discussed my last column with one of my friends (who writes for *C Vu* under the nom de plume of 'The Harpist') I realised that I might have written rather more about the previous month's problem.

C is almost a pure value oriented language. The only concessions are for functions and arrays. These two types are actually passed as values to suitably typed pointers but the syntax of dereferencing pointers has been carefully designed to provide a kind of pseudo referencing mechanism. I believe I am right to assert that all expressions in C return values. In this context, C separates values into 'lvalues' that refer to storage (suitable as the left operand of an assignment operator, or for storage in a pointer-type variable) and 'rvalues' that are appropriately used as the right operand of assignment operators).

C++ added a reference type that at first glance seems to be little more than some syntactic sugar to hide pointers. It took me a long time to realise that behind the syntactic sugar there is a very significant change. As C++ has developed, this change has gradually permeated throughout the grammar of the language. The dichotomy between rvalue and lvalue no longer applies. Consider the following (minimalist) function candidates:

```
(1) int fn (int i) { return i = 3; }
(2) int * fn(int * ip) { return *ip = 3; }
(3) int * fn(int * ip) { return ip = 3; }
(4) int * fn(int * ip) { return ip = (int *)3; }
(5) int * fn(int * ip) { return &(*ip = 3); }
(6) int & fn(int & ir) { return ir = 3; }
```

The first of these works quite happily in both C and C++ (and, as it happens, Java). The last one works only in C++. The second one fails in both languages but for slightly different reasons. In C it fails because the assignment expressions return rvalues and you cannot convert an rvalue of type `int` to `int *`. In C++ it fails because there is no implicit conversion from an lvalue of type `int` (or `int &`) to `int *`.

The third candidate fails because both languages require explicit casts to convert integer literals to `int *` values. The fourth candidate works for both C and C++. In C, the return value of the expression `[ip = (int *)3]` is 3 as an `int *`, while in C++ it is a reference to `ip` that is immediately dereferenced to 3 as an `int *`.

The fifth candidate illustrates this subtle difference in the return types of expressions in C and C++: `&(*ip = 3)` works fine in C++ but fails in C.

The sixth candidate uses a C++ feature that does not exist in C. Many programmers who insist upon looking under the hood (for implementation details) think that this version is only the second one with a sprinkling of sugar. Actually, it is more akin to the fifth version, but note that for either of the last two versions to work the grammar of assignment expressions had to be changed.

I contend that the introduction of reference types in C++ was very much more than syntactic sugar. Early writers presented it that way

to help converts coming from C. To some extent they succeeded but at the cost of obscuring the fundamental shift of view. Consider:

```
int & fn(int & ir) { return ir; }
```

Now you understand the way that assignment expressions work in C++, it might seem a little odd that we should have to read the value from `ir` before returning a reference to it. It made perfect sense for the grammar of C to require that an expression consisting of a single identifier be evaluated for an rvalue. Such a statement could mean nothing else in C. If you wished to obtain an address (lvalue), you would have to write `&ir`. The grammar of C specifically excludes any attempt at accessing `ir` in the evaluation of `&ir`. Logically binding an identifier to a reference should not include accessing it. It took C++ until 1996 to make that change consistent across all uses of such expressions. Consider:

```
void gn(int **)  
int * fn (int * ip) {  
    gn(&ip);  
    return ip;  
}
```

This kind of code is a candidate for creating hanging pointers. Without knowing what `gn()` does you have no way of knowing what you may expect to be true of `ip` when `gn()` returns. However, consider trying to write something similar in C++. You might try:

```
int & fn(int & ir) {  
    gn(&ir);  
    return ir;  
}
```

It will not work. Nor can I construct any other way of using the original `gn()` in the context of the version of `fn()` that has its arguments passed by reference rather than by pointer.

Built-in types

As I was thinking over this issue between C and C++, I got to thinking about Java. Both C and C++ apply mainly consistent rules to their mechanisms for passing values. I do not need to know if the type is built-in or user-defined to grasp what will happen. C's mechanism for handling arrays leaves a hole in that you must understand why a parameter is a pointer before passing it the address of a singleton or an array. For this reason I strongly advocate that you write parameters as `Type t[]` if the argument needs to be the address of an array. (Indeed, I wish compilers would support this by issuing warnings when the address of a single instance is passed to a parameter declared as an array, and vice versa. Of course, all bets are off when the argument is extracted from a pointer variable.) In C++ we can avoid many of the problems by using coding rules that strongly encourage programmers to use `vector<>` rather than C-arrays.

Java is entirely predictable but completely inconsistent. Its built-in types are treated as attributes and are passed by value. There is no other



way that they can be passed. All its derived (arrays) and user-defined types are passed as pointers.

Note that Java programmers can use something like the inverse of a C trick. Replace declarations of single instances of built-in types with arrays of size 1. The C trick is to wrap arrays in structs if you need to pass them by value.

There is a vast difference between references in Java and C++. A reference in C++ is bound to an object via an existing name (yes, I know that you can bind `const` references to unnamed temporary objects, but that is a special dispensation – read as ‘useful inconsistency’). You cannot rebind a reference to a different object, any more than you can rebind any other identifier. Put another way, C and C++ identifiers uniquely identify objects (regions of storage). Taking the address of an object allows you to handle an object anonymously – C/C++ pointers are relocatable handles to possibly anonymous objects. However, C++ references are not like that. During its lifetime a C++ reference only ever refers to a single object.

Now look at Java. Only built-in types have identifiers (and these are unique – objects of built-in type can only ever be accessed by the identifier provided at their moment of creation). All Java objects are anonymous. During its lifetime a Java identifier can be bound to many different objects and many different identifiers can access a single object.

I believe that understanding issues such as the above is important to those wanting to port code between languages. Part of the design criteria for C++ was to support existing C code. The behaviour of C code compiled as C++ should not cause surprises. This means that someone who approaches C++ with a C mind-set may not get maximal benefit, but their code should still work correctly and efficiently. No such constraint applied to the design of Java, and I believe that it is very unfortunate that Java looks like C. It never will be a ‘safer C’ or even a ‘safer C++’. Sadly, though the Java concept is excellent in appropriate circumstances, it failed to promote itself for what it is and instead promoted itself as a cure for problems in C and C++. Unfortunately, many managers believe the hype.

Last month's problem

Well-written code can be reused because silly errors by the user will be diagnosed. Unfortunately, many class designers miss subtleties with the result that their work is fragile. In this light, ask yourself what is wrong with the definition of the following value type:

```
class AddOnlyInteger{
    int i_;
public:
    AddOnlyInteger(int i=0);
    AddOnlyInteger & operator+= (AddOnlyInteger rhs);
    int getValue();
};
AddOnlyInteger operator+ (AddOnlyInteger, AddOnlyInteger);
```

In case you are wondering, you do not need to know anything about the implementation. That is why I have not provided function bodies.

The quick answer is that the global operator function must be declared as:

```
AddOnlyInteger const operator+ (AddOnlyInteger,
                                AddOnlyInteger);
```

I bet your first reaction was the same as mine: that `const` qualification of a return by value cannot possibly do anything and will be ignored. For built-in types you would be correct. For user defined types you would be wrong. The reason is that C++ added generalised support for the idiom exemplified by:

```
MakeTurtle(5,7).left(90).forward(100).right(90);
```

In other words, it ensured that it was legal to call member functions on the return values of functions, even if those returns were by value rather than by reference. This was the final death of the dichotomy between lvalues and rvalues in C++. The distinction has been blurred beyond redemption. The result is that:

```
AddOnlyInteger a(12), b(13), c;
```

```
a + b = c;
```

will compile with the original declarations because the second line is parsed as:

```
operator + (a,b). operator = (c);
```

The change to the definition of `operator + ()` restricts the return value to being used with `const` member functions. Now the compiler will reject such nonsensical code.

I wonder how many of you thought that I should have defined the `operator += ()` as:

```
AddOnlyInteger & operator+= (AddOnlyInteger const & rhs);
```

I hope second thoughts showed why the original works, and probably more efficiently.

Masking values

James Reeves emailed me about my assertion that:

```
i ^= i & 7;
```

was the simplest portable way of masking the three lower order bits of `i`. He proposed:

```
i &= ~7;
```

There are many reasons why you should prefer James' solution on specific hardware. Among them are clarity and efficient code generation (both size and speed). However, a combination of two things makes it inappropriate as a general solution. If the type of `i` is larger than `int` (eg `long`) the value of `~7` will have to be promoted. The high order bit will be set so it will be treated as a negative value of type `int`. There are three allowed representations of negative values – two's complement, one's complement and, sign and value – and there are machines using all three of these representations. Two's complement is so dominant that it is easy to forget that the others exist. James' solution certainly works for two's complement and definitely fails for sign and value (if `~7` has to be promoted). I am not sure what the general result would be for one's complement architectures.

This month's problem

Can you see any problems with:

```
int mask (int raw, int mask){
    return (raw & mask);
}

int main(){
    int i = getint("What raw value? "),
        j = getint("What mask? ");
    printf("The masked value is: %d", mask(i, j));
    return 0;
}
```

assuming that `getint(char const *)` has been defined appropriately?

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The fundamental collections in life

JDK 1.2 introduces the Java Collections API. Tom Guinther gets to grips with Java's provision of ready-made container data structures.

In the US there is a saying: 'Reading is fundamental'. Since you are an *EXE* subscriber (you are a subscriber aren't you?) and you're reading this then you probably have reading pretty well in the bag. When it comes to computer programming I like to say that 'Data structures are fundamental' and the subject of this month's column, the Java Collections API, is here to help make the fundamentals of your Java programming easier than ever.

The Collections API

This set of APIs is new with JDK 1.2 (I covered the basic enhancements to JDK 1.2 last month). It provides basic abstractions of fundamental data structures (lists, arrays, maps, etc) and centralises the functionality through a set of core classes. The collection support that was available in JDK 1.1 and prior releases underwhelmed many developers. This is not surprising considering that quite a few Java programmers are also C++ programmers who may be used to the overly sophisticated support provided by the C++ Standard Template Library (STL). Personally, I am not a big fan of STL and there is no doubt in my mind that a small part of the surge in Java programming is a revolt against the unwieldy and complex STL.

When it comes to a collection API there are three fundamental goals: store and remove data, find/retrieve data, and traverse data (aka iteration). The Java Collections API is primarily concerned with 'holding things.' A collection is an abstraction of 'holding things' and provides methods to perform actions on a 'collection of things held'.

There are three basic actions on a collection that mirror the fundamental goals: add/remove, find, and iterate. Any collection worth its salt will have these operations. What is not specified, and this is a very important point, is *how* data is added, removed, found, or iterated. That is because these actions are implementation dependent, and as such, are closely tied to the underlying data structure(s) used to implement the collection. As we will see, the Java Collections API makes a clear separation between the abstraction and the implementation. This allows the developer to select the most optimal implementation without requiring any (well almost) code change.

While different collection types have the same basic operations, they may have entirely different rules for adding, finding, and removing elements. A good example of this is that adding an item to a *Set* implies that if the item already exists the new element won't be added. Contrast this to a *Bag*, which typically holds anything, even unrelated types and duplicates of the same item.

The core collection interfaces

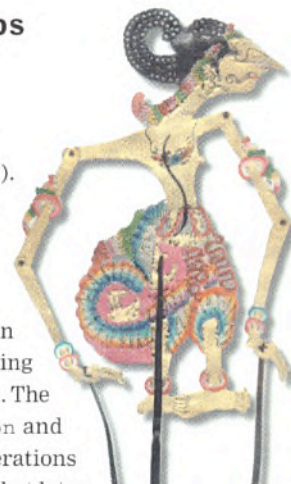
The Java Collections API revolves around a small set of base interfaces, which makes it a lot easier to grasp. The primary interface is *Collection* and it provides the functionality outlined above. See the box-out *Primary methods of Collection* for the most important members of *Collection*. Not all the methods of the interface are listed, but they are the primary methods that others are built upon.

Listing 1 illustrates basic usage of the *Collection* interface. The example uses *ArrayList* as a concrete implementation (remember

Collection is just an abstraction).

The JDK documentation states, 'Collection implementation classes typically have names of the form *<Implementation><Interface>...*', which implies that the example uses an *Array* implementation (the underlying data structure) and the interface *List*. The interface *List* extends *Collection* and implies certain semantics about operations on the underlying data, but more on that later.

The code is pretty straightforward, adding 20 string items to a collection, creating an iterator to walk through each item in the collection, and printing its value. Next, an array is obtained by calling the *Collection* method, *toArray()*, and removing the sixth and ninth items. The code verifies that the items were deleted by calling the *size()* method of *Collection* and printing the number of elements. Because we deleted two items, the answer should be 18. Finally, the



```
import java.util.* ;
public class cc
{
    public static void main(String args[])
    {
        //
        Collection c = new ArrayList() ;

        // add 20 items to the list
        for (int x = 1; x <= 20; x++ )
            c.add("Item #" + Integer.toString(x)) ;

        // create an iterator to walk thru each item
        Iterator iter = c.iterator() ;

        // print each item until we hit the end of the list
        while(iter.hasNext()) System.out.println(iter.next()) ;

        // display the number of items
        System.out.println("The collection has "
            + Integer.toString(c.size()) + " items") ;

        // convert the collection to an array of objects
        Object cArray[] = c.toArray() ;

        System.out.println("Deleting items #6 and #9") ;

        // remove item #6
        if (c.contains(cArray[6])) c.remove(cArray[6]) ;

        // remove item #9
        if (c.contains(cArray[9])) c.remove(cArray[9]) ;

        // display the number of items after deletions
        System.out.println("The collection has "
            + Integer.toString(c.size()) + " items") ;

        // clear all items so the 'refernces' are removed
        c.clear() ;

        // make sure it is really empty
        if (c.isEmpty()) System.out.println("All items were
            cleared!") ;
    }
}
```

Listing 1 – Basic usage of the *Collection* interface.

Primary methods of *Collection*

| | |
|----------|--|
| add | Add an object to the collection |
| clear | Remove all elements from the collection |
| contains | Determine if an object is in the collection |
| isEmpty | Determine if the collection is empty (0 items) |
| iterator | Create an iterator to traverse the items in the collection |
| remove | Remove an element from the collection |
| size | Return the number of elements in the collection |

code removes all the items from the collection by calling the `clear()` method. As a double-check, the `isEmpty()` member function is used to verify that the collection really is empty.

The two core collection interfaces that extend *Collection* are *List* and *Set*. A *Set* is an interface that models the mathematical *set* abstraction, and does not allow duplicate items. Typically, it is unordered, although that is definitely not a requirement. If you look closely at the description of a *Set* you will notice that it doesn't add any new methods. However, it is a *Collection* that enforces its own special semantic restrictions. Listing 2 illustrates very basic usage of the *Set* interface.

My only comment about the code is that it uses a *HashSet*, which means that a hash table is used as the implementation. I chose it because it is the 'normal' choice. In this particular example the small number of items in the set would have gained a performance (and space) advantage if I had used an *ArraySet*. When a large number of items are involved, using an *ArraySet* would result in severe performance penalties, and a *HashSet* or *TreeSet* would be the recommended choice.

One word of caution: the behaviour of a *Set* is not specified if the value of an object is changed while the object is in use as an element in the *Set*. Thus it is possible to create a duplicate or invalid set if an object in the set is changed by external code.

A *List* is an ordered collection or sequence, over which you have precise control of the position of items that are added to the list. Like an array, you can access an item in the list by using an integer index into the list. If you think like me, when someone says 'list' you automatically think linked list. A better way to think about the *List* interface is to think of it as being like an array, which does not preclude the list from actually being a linked list since you can coerce array semantics onto a traditional linked list data structure quite easily. Typically, a *List* would allow duplicate, or null items to exist. Unlike *Set*, the *List* interface extends the functionality of *Collection* so that indexed operations can be performed. It also includes the `listIterator()` method,



```
import java.util.* ;
class SetTest {
    static public void main(String args[])
    {
        String blue = "Blue" ;
        String red = "Red" ;
        String green = "Green" ;
        String orange = "Orange" ;

        Collection hset = new HashSet() ;

        // add three of four items to the set
        hset.add(blue) ;
        hset.add(red) ;
        hset.add(green) ;

        // print items in collection
        Iterator iter = hset.iterator() ;
        while(iter.hasNext()) System.out.println(iter.next()) ;

        // do a few item 'lookups' and print the result
        System.out.println("green= " + hset.contains(green) ) ;
        System.out.println("orange= " + hset.contains(orange) ) ;

        // try to add green (again) and a new item, orange
        System.out.println("adding green= " + hset.add(green) ) ;
        System.out.println("adding orange= " + hset.add(orange) ) ;

        // print all the items in the collection
        iter = hset.iterator() ;
        while(iter.hasNext()) System.out.println(iter.next()) ;
    }
}
```

Listing 2 – Basic usage of the *Set* interface.

which returns an iterator that can insert, remove, and bi-directionally traverse the items in the list.

The last member of the core collection interfaces we are going to discuss is *Map*. The *Map* interface does not extend the *Collection* interface and should be thought of as a peer collection interface.

A *Map* is a collection that maps keys to values. There can only be one occurrence of a key (no duplicates allowed, similar to a *Set*), and each key has one, and only one, value. If this sounds like class *Dictionary*, that's because it really is. The *Map* class is designed to replace class *Dictionary* (although legacy code can still use *Dictionary*).

See the box-out *Primary methods of Map*. The *Map* interface has other functions, many of which (such as `clear()` and `isEmpty()`) overlap with the methods in *Collection*. The `entries()` method listed in the table returns a *Map.Entry*, which is class representing a key-value pair.

One thing I noticed is that the *Map* interface does not have an `iterator()` method, which is not a limitation because you can obtain a *Set* of the keys and then use its iterator.

Further reading

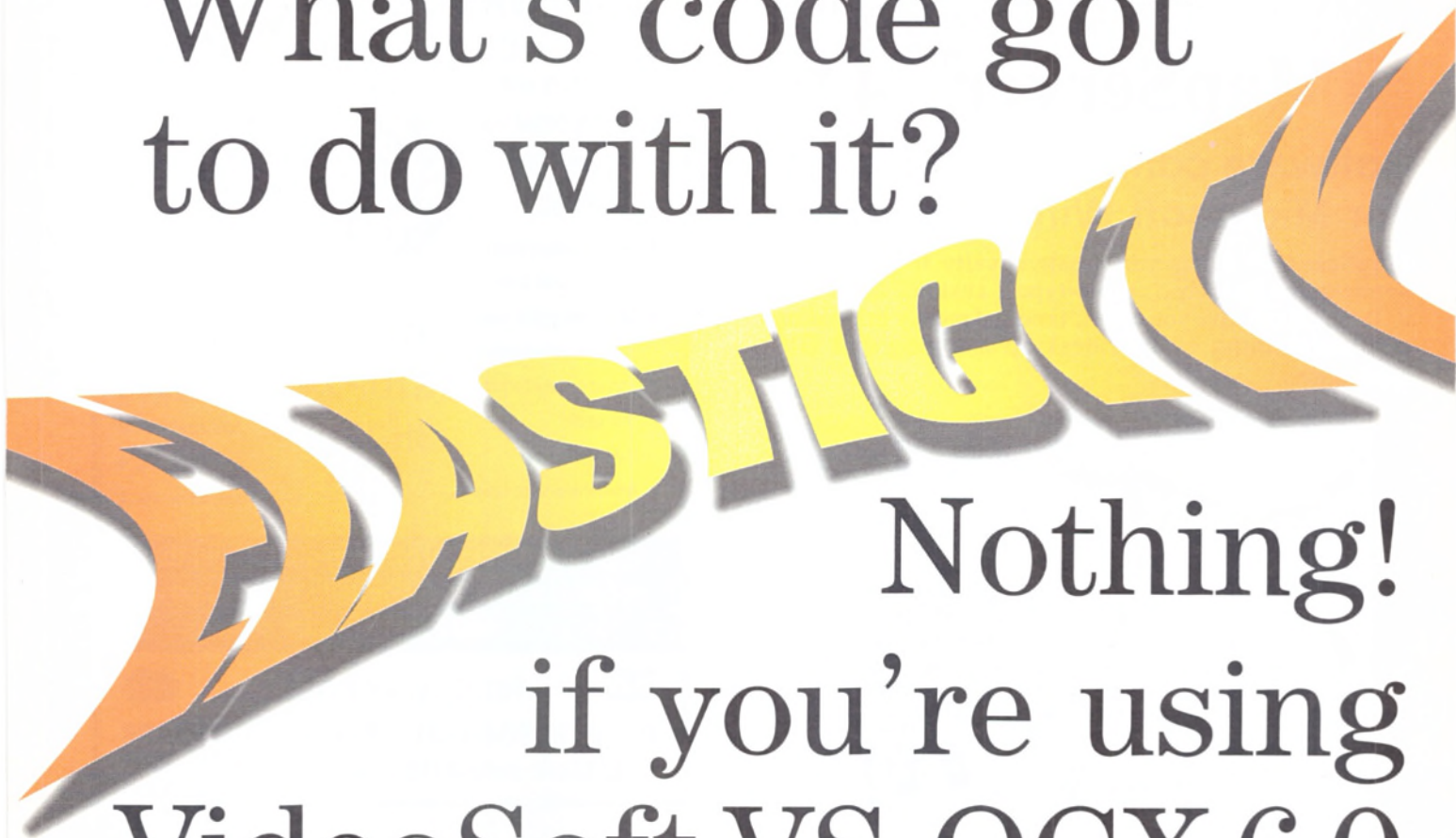
The shelves of my book case sag and groan under the voluminous (and somewhat dusty) tomes written by the masters of computer science. There are such lauded names as Niklaus Wirth and Donald Knuth, computer scientists in every aspect of the words, who wrote at length about the fundamental data structures and the algorithms for manipulating them. If you ever want to improve your skill-set, don't hesitate to pick up a book with in-depth coverage of topics such as linked lists, trees, and hash-tables. In this case reading definitely is fundamental and, if you're lucky (I wasn't), the examples will be written in a modern language, not Algol67. ■

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Primary methods of *Map*

| | |
|---------------|--|
| containsKey | Determine if a specified key exists in the Map |
| containsValue | Determine if a specified value exists in the Map |
| entries | Return a <i>Set</i> view of the entries in the Map |
| get | Return the value for a given key |
| keySet | Return a <i>Collection</i> view of the keys in the Map |
| put | Add a key/value pair to the Map |
| values | Return a <i>Collection</i> view of the values in the Map |

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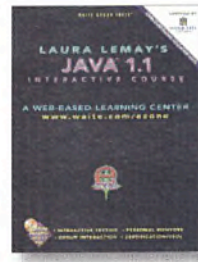
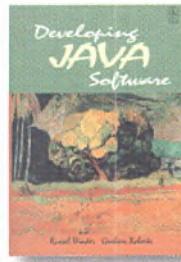
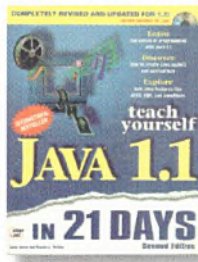
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Gavin Smyth reviews four books for Java beginners



Java has been around long enough to be viable as the first computer language someone learns rather than just yet another language to add to knowledge of, say, C++. This means there is a space on the bookshelves for books that teach both good programming practices and the nuts and bolts of the language, without relying on much previous programming experience. This is a look at a few books which claim to address this need, picked more or less at random. All have been written (or at least updated) with Java 1.1 in mind, and all of them describe enough of the language to get you up and running with simple applets and applications. These cover topics such as the language syntax, classes, packages, exceptions, threads, data reading and writing (both to file and across the network), and at least an overview of the standard Java libraries.

Something you will not find in any of these books is any criticism of the language – all the authors seem to be Java evangelists who give the impression that Java is the one true language.

Beginning Java starts off at a very basic level – almost tediously basic. For example, after describing how to declare a `long` with some sample code, Ivor Horton then repeats this (briefly) for `int`, `byte`, and `short`. About half way through, things do speed up, with a very good description of the document-view architecture – why you might want it, and how to implement it – and the development of a sizeable Java example employing this architecture. The book does not cover JNI (native methods) and in fact talks mainly, though not exclusively, about building applets. It does not teach software development and makes no real attempt to describe how a program should be structured. However, if you knew even a little about programming, you would not need much of the detailed explanations in the first half of this book.

– **Verdict:** Average

Teach Yourself Java 1.1 in 21 Days is clear and understandable, with a pleasant informal writing style, and it proceeds at a good pace. There is some unnecessary repetition and, again, not much about the development of programs. Unfortunately, the examples are all very short snippets of code and, although they are generally complete applications or applets, you will not get the feel of a large program from this book. Java and the libraries are not covered in as much depth as the Wrox book. It concludes with a brief overview of Java and the Java virtual machine internals, which may be too detailed to be of interest to newcomers to the language. Charles Perkins (each chapter is individually credited to one or other of the authors) does delve into JNI. However, earlier in the book, an explanation of logical operators is said to be too complex to include – an odd mixture of the complex and the simple.

The book gave the impression of having been hastily updated from Java 1.0: where 1.1 has changed things the text has been updated, but many new features are simply omitted. Nonetheless, the aspects of the language that are likely to be important to someone just learning the language are dealt with well.

✓ **Verdict:** Recommended

Developing Java Software is much more academic in style than the other books: it places less emphasis on Java and much more on software development and the writing style is not as informal. This book really does teach program design and merely uses Java as the language of implementation. The Java language is covered adequately but the standard libraries are only mentioned in passing. For example, AWT is barely touched upon, although the book will teach you more than you are likely to want to know about AVL trees. (With the lower price of this book, you might be able to afford one on AWT too!) There are a large number of clearly explained and realistic programming examples, including relatively large and complex applications from a number of

Title: *Beginning Java*
Author: Ivor Horton
Publisher: Wrox Press, 1997
ISBN: 1-861000-27-8
Price: £36.99
Pages: 1000

Title: *Teach Yourself Java 1.1 in 21 Days*
Author: Laura Lemay & Charles Perkins
Publisher: Sams.net Publishing, 1997
ISBN: 1-57521-142-4
Price: £37.50
Pages: 750

Title: *Developing Java Software*
Author: Russel Winder & Graham Roberts
Publisher: John Wiley & Sons, 1997
ISBN: 0-471-97655-5
Price: £24.95
Pages: 800

Title: *Laura Lemay's Java 1.1 Interactive Course*
Author: Laura Lemay, Charles Perkins, Michael Morrison, & Dan Groner
Publisher: Waite Group Press, 1997
ISBN: 1-57169-083-2
Price: £46.14
Pages: 1140

domains. Usually, the examples are approached from several directions and the trade-offs explained. Winder and Roberts treat the reader as an intelligent learner and do not tend to belabour minor points of syntax as the other books do.

✓ **Verdict:** Recommended if you're completely new to programming

I was going to stop at three books, but then the *Java 1.1 Interactive Course* dropped into my hands. This book is virtually identical to an earlier version of *Teach Yourself Java in 21 Days* with the addition of some mindlessly trivial quiz questions at the end of each section, several large appendices listing the contents of the Java standard packages, a gimmicky online 'learning centre' which you are entitled to use when you buy the book, and several pounds to the price. Since this book is so similar to Ms Lemay's other one there is not much else to say about it.

✗ **Verdict:** Give this one a miss

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| Implementing & Supporting Microsoft Proxy Server 2.0 | TBA | 2 | 450 | Manchester | ITS |

OBJECT ORIENTED TECHNOLOGY

| | | | | | |
|-------------------------------------|----------|---|------|------------|-------|
| Object Technology Introduction | Monthly | 4 | 1425 | London | LTREE |
| Object-Oriented Analysis and Design | Monthly | 5 | 1675 | London | LTREE |
| Manager's Approach to Objects | 05/05/98 | 1 | 395 | London | VAL |
| Manager's Approach to Objects | 01/06/98 | 1 | 395 | London | VAL |
| Use cases | 06/05/98 | 2 | 795 | London | VAL |
| Use cases | 02/06/98 | 2 | 795 | London | VAL |
| Analysis with UML | 14/04/98 | 4 | 1295 | London | VAL |
| Analysis with UML | 11/05/98 | 4 | 1295 | London | VAL |
| Analysis with UML | 08/06/98 | 4 | 1295 | London | VAL |
| Analysis with UML | 29/06/98 | 4 | 1295 | Manchester | VAL |
| A Technical Introduction to CORBA | 27/04/98 | 1 | 395 | London | VAL |
| A Technical Introduction to CORBA | 18/05/98 | 1 | 395 | London | VAL |
| A Technical Introduction to CORBA | 15/06/98 | 1 | 395 | London | VAL |
| A Technical Introduction to CORBA | 11/05/98 | 1 | 395 | Manchester | VAL |
| A Technical Introduction to CORBA | 20/04/98 | 1 | 395 | Edinburgh | VAL |
| CORBA Enterprise Architectures | 28/04/98 | 3 | 1295 | London | VAL |
| CORBA Enterprise Architectures | 19/05/98 | 3 | 1295 | London | VAL |
| CORBA Enterprise Architectures | 16/06/98 | 3 | 1295 | London | VAL |
| CORBA Enterprise Architectures | 12/05/98 | 3 | 1295 | Manchester | VAL |
| CORBA Enterprise Architectures | 21/04/98 | 3 | 1295 | Edinburgh | VAL |
| A Technical Introduction to Java | 14/04/98 | 1 | 395 | London | VAL |
| A Technical Introduction to Java | 11/05/98 | 1 | 395 | London | VAL |
| A Technical Introduction to Java | 08/06/98 | 1 | 395 | London | VAL |
| A Technical Introduction to Java | 22/06/98 | 1 | 395 | Manchester | VAL |
| A Technical Introduction to Java | 26/05/98 | 1 | 395 | Edinburgh | VAL |
| Java Enterprise Architectures | 15/04/98 | 3 | 1295 | London | VAL |
| Java Enterprise Architectures | 12/05/98 | 3 | 1295 | London | VAL |
| Java Enterprise Architectures | 09/06/98 | 3 | 1295 | London | VAL |
| Java Enterprise Architectures | 23/06/98 | 3 | 1295 | Manchester | VAL |
| Java Enterprise Architectures | 27/05/98 | 3 | 1295 | Edinburgh | VAL |
| Advanced IBM Smalltalk | 27/7/98 | 5 | 1375 | Southmptn | OBJE |
| Advanced IBM Smalltalk | 12/10/98 | 5 | 1375 | Southmptn | OBJE |

| Course | Date | Days | Cost | Place | Company | Course | Date | Days | Cost | Place | Company |
|--|-----------|------|------|------------|---------|--|-----------------|------|--------|------------|---------|
| Building Distributed Applications using VisualAge for Smalltalk | 5/8/98 | 3 | 895 | Southmptn | OBJE | Windows Programming in C | Regularly | 5 | 1495 | Call | QA TR |
| Building Distributed Applications using VisualAge for Smalltalk | 19/10/98 | 3 | 895 | Southmptn | OBJE | Windows Programming with Visual C++ and the MFC Library | Regularly | 5 | 1475 | Call | QA TR |
| Introduction to VisualAge | 6/7/98 | 5 | 1375 | London | OBJE | Building Applications with Microsoft Transaction Server | Regularly | 5 | 1595 | Call | QA TR |
| Introduction to VisualAge | 7/9/98 | 5 | 1375 | Southmptn | OBJE | Fasttrack Windows NT 5 for Developers | Regularly | 2 | 650 | Call | QA TR |
| Introduction to VisualAge | 5/10/98 | 5 | 1375 | London | OBJE | Developing OLE/ActiveX Controls with the MFC Library | Regularly | 5 | 1495 | Call | QA TR |
| Building Applications using VisualAge for Smalltalk | 13/7/98 | 5 | 1375 | Southmptn | OBJE | Windows OLE System Programming | Regularly | 5 | 1595 | Call | QA TR |
| Building Applications using VisualAge for Smalltalk | 14/9/98 | 5 | 1375 | Southmptn | OBJE | Software Project Planning and Management | 21/7/98 | 4 | 1425 | London | LTREE |
| Building Applications using VisualAge for Smalltalk | 12/10/98 | 5 | 1375 | Southmptn | OBJE | Project Management: Skills for Success | Monthly | 4 | 1425 | London | LTREE |
| Team Programming using VisualAge for Smalltalk | 28/9/98 | 2 | 650 | Southmptn | OBJE | Software Project Planning and Management | 25/8/98 | 4 | 1425 | London | LTREE |
| Programming in IBM Smalltalk | 10/8/98 | 5 | 1375 | London | OBJE | Managing Enterprise Software Development Projects | Regularly | 3 | 995 | Call | QA TR |
| Programming in IBM Smalltalk | 5/10/98 | 5 | 1375 | Southmptn | OBJE | DSDM Practitioner | Regularly | 3 | 945 | Call | QA TR |
| MVS Smalltalk:Transaction Managed Objects | 26/10/98 | 5 | 1450 | London | OBJE | Project Management Skills | Regularly | 4 | 1245 | Call | QA TR |
| VisualAge for Smalltalk Programmers | 24/8/98 | 5 | 1375 | Southmptn | OBJE | Application Development with Microsoft Excel 5.0 using Visual Basic for Applications | TBA | 5 | 1050 | Manchester | ITS |
| Programming in VisualWorks | call | 4 | 1025 | Southmptn | OBJE | Developing Applications with C++ using the Microsoft Foundation Class Library | TBA | 5 | 1050 | Manchester | ITS |
| Object Orientated Programming with VisualAge for Java | call | 5 | 1250 | Southmptn | OBJE | SOFTWARE | | | | | |
| Building Applets & Applications with VisualAge for Java | 6/7/98 | 5 | 1250 | Southmptn | OBJE | Identifying and Confirming User Requirements | Monthly | 4 | 1425 | London | LTREE |
| Building Applets & Applications with VisualAge for Java | call | 5 | 1250 | Southmptn | OBJE | Implementing the Year 2000 Conversion | Monthly | 4 | 1425 | London | LTREE |
| OO Programming with VisualAge for Java at the weekend | call | 4 | call | Southmptn | OBJE | SYSTEMS ANALYSIS | | | | | |
| Lding TOPLink Enabled Java Applications | 22/7/98 | 3 | call | Southmptn | OBJE | Software Quality Assurance | 28/7/98 | 4 | 1425 | London | LTREE |
| Object-Oriented Concepts Analysis & Design | call | 3 | 800 | Southmptn | OBJE | Software Systems Analysis and Design | Monthly | 4 | 1425 | London | LTREE |
| Object-Oriented Analysis and Design using the Booch Method | Regularly | 4 | 1245 | Call | QA TR | Hands-on Microsoft Exchange 5 | Monthly | 4 | 1425 | London | LTREE |
| Object-Oriented Analysis and Design using Rumbaugh's OMT | Regularly | 5 | 1475 | Call | QA TR | Windows Architecture | 5/4/98 | 4 | 1425 | London | LTREE |
| Developing CORBA Applications for C++ | Regularly | 3 | 1375 | Call | QA TR | Building Office 97 Intranet Applications | Monthly 21/4/98 | 1425 | London | LTREE | |
| Object-Oriented Design for C++ Development | Regularly | 5 | 1475 | Call | QA TR | SYSTEMS MANAGEMENT | | | | | |
| Overview of Distributed Objects | Regularly | 1 | 295 | Call | QA TR | Implementing & Supporting Microsoft Systems Management Server 1.2 | TBA | 5 | 1050 | Manchester | ITS |
| Object-Oriented Primer | Regularly | 1 | 295 | Call | QA TR | Implementing & Supporting Microsoft S systems Management Server 1.1 | TBA | 5 | 1050 | Manchester | ITS |
| Object-Oriented Software Development | Regularly | 3 | 995 | Call | QA TR | TESTING | | | | | |
| Object-Oriented Analysis and Design using the Unified Modelling Language | Regularly | 5 | 1475 | Call | QA TR | Practical Software Testing Methods | Monthly | 4 | 1425 | London | LTREE |
| PC SUPPORT | | | | | | UNIX | | | | | |
| PC Configuration and Troubleshooting | Bi-weekly | 4 | 1425 | London | LTREE | Unix Fundamentals | 06/07/98 | 3 | 690 | Reading | PTR |
| Advanced PC Configuration Troubleshooting & Data Recovery | 18/8/98 | 4 | 1425 | Edinburgh | LTREE | Unix Fundamentals | 27/07/98 | 3 | 690 | Reading | PTR |
| PC Configuration and Troubleshooting | 15/9/98 | 4 | 1425 | Edinburgh | LTREE | Unix Fundamentals | 24/08/98 | 3 | 690 | Reading | PTR |
| Advanced PC Configuration Troubleshooting & Data Recovery | Monthly | 4 | 1425 | London | LTREE | Unix Fundamentals | 28/09/98 | 3 | 690 | Reading | PTR |
| Advanced PC Support | Regularly | 4 | 1245 | Call | QA TR | Unix Shell Programming | 09/07/98 | 2 | 460 | Reading | PTR |
| PC Fundamentals | Regularly | 3 | 845 | Call | QA TR | Unix Shell Programming | 30/07/98 | 2 | 460 | Reading | PTR |
| PC Support | Regularly | 4 | 1175 | Call | QA TR | Unix Shell Programming | 27/08/98 | 2 | 460 | Reading | PTR |
| PROGRAMMING | | | | | | Advanced Unix Tools & Shell Scripts | 03/08/98 | 2 | 460 | Reading | PTR |
| VisiBroker for Java | 20/04/98 | 4 | 1295 | London | VAL | Advanced Unix Tools & Shell Scripts | 31/08/98 | 2 | 460 | Reading | PTR |
| VisiBroker for Java | 18/05/98 | 4 | 1295 | London | VAL | Unix System Administration | 15/07/98 | 3 | 690 | Reading | PTR |
| VisiBroker for Java | 15/06/98 | 4 | 1295 | London | VAL | Unix System Administration | 05/08/98 | 3 | 690 | Reading | PTR |
| VisiBroker for Java | 05/05/98 | 4 | 1295 | Manchester | VAL | Unix System Administration | 02/09/98 | 3 | 690 | Reading | PTR |
| Advanced VisiBroker for Java | 27/04/98 | 3 | 995 | London | VAL | Unix Networking | 16/07/98 | 3 | 460 | Reading | PTR |
| VisiBroker for C++ | 14/04/98 | 4 | 1295 | London | VAL | Unix Networking | 13/08/98 | 3 | 460 | Reading | PTR |
| VisiBroker for C++ | 22/06/98 | 4 | 1295 | London | VAL | Unix Networking | 10/09/98 | 3 | 460 | Reading | PTR |
| Orbix for C++ | 11/05/98 | 4 | 1295 | London | VAL | UNIX Introduction | Monthly | 4 | 1425 | London | LTREE |
| Visual Basic 5 for Business Solutions | Bi-weekly | 4 | 1425 | London | LTREE | UNIX Tools and Utilities | Monthly | 4 | 1425 | London | LTREE |
| Developing Windows CE Applications with Visual C++ | Monthly | 4 | 1425 | London | LTREE | UNIX Workstation Administration | 4/8/98 | 4 | 1425 | London | LTREE |
| Visual InterDev for Enterprise Applications | 8/9/98 | 4 | 1425 | London | LTREE | UNIX Server Administration | 8/9/98 | 4 | 1425 | London | LTREE |
| Win32 Systems and Network Programming | 22/9/98 | 4 | 1425 | London | LTREE | X Window System Programming | 4/8/98 | 4 | 1425 | London | LTREE |
| Programming ActiveX with MCF | Monthly | 4 | 1425 | London | LTREE | UNIX Programming | 11/8/98 | 4 | 1425 | London | LTREE |
| Visual C++: Windows Programming with MFC | 3/8/98 | 5 | 1675 | London | LTREE | Perl Programming | Monthly | 4 | 1425 | London | LTREE |
| Java Programming: Hands-On | Monthly | 4 | 1425 | London | LTREE | UNIX Fundamentals | Regularly | 4 | 1195 | Call | QA TR |
| Java for Enterprise Systems | 7/7/98 | 4 | 1425 | London | LTREE | UNIX Programming | Regularly | 5 | 1375 | Call | QA TR |
| Visual J++ | Monthly | 4 | 1425 | London | LTREE | UNIX Systems Administration | Regularly | 4 | 1195 | Call | QA TR |
| Introduction to Programming: Hands-on Workshop | Monthly | 4 | 1425 | London | LTREE | Mastering UNIX Shell Scripts | Regularly | 4 | 1195 | Call | QA TR |
| C Programming | Monthly | 4 | 1425 | London | LTREE | Solaris Systems Administration | Regularly | 4 | | Call | QA TR |
| Introduction to C++ for Non-C Programmers | Monthly | 4 | 1425 | London | LTREE | WINDOWS | | | | | |
| Kornshell Programming | Monthly | 4 | 1425 | London | LTREE | Windows 95 Support and Networking | Monthly | 5 | 1675 | London | LTREE |
| Developing Windows NT Server Applications | Regularly | 5 | 1595 | Call | QA TR | Integrating Microsoft Office 97 | 21/7/98 | 4 | 1425 | London | LTREE |
| Mastering Web Site Development using Visual InterDev | Regularly | 5 | 1445 | Call | QA TR | | | | | | |
| Win32 Programming Essentials | Regularly | 5 | 1495 | Call | QA TR | | | | | | |
| Developing ActiveX Controls and Components | Regularly | 5 | 1495 | Call | QA TR | | | | | | |

| Course | Date | Days | Cost | Place | Company | COMPANY DETAILS |
|--------|------|------|------|-------|---------|-----------------|
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|--|---------|---|------|------------|-------|
| Hands-On TCP/IP Internetworking on Windows NT | Monthly | 4 | 1425 | London | LTREE |
| Windows NT 5 | Monthly | 5 | 1675 | London | LTREE |
| Microsoft Windows Operating Systems and Services Architecture I | TBA | 2 | 450 | Manchester | ITS |
| Microsoft Windows Architecture I | TBA | 2 | 450 | Manchester | ITS |
| Microsoft Windows Operating Systems and Services Architecture II | TBA | 3 | 650 | Manchester | ITS |
| Microsoft Windows Architecture II | TBA | 3 | 650 | Manchester | ITS |
| Microsoft Windows Architecture I & II | TBA | 5 | 1050 | Manchester | ITS |

WINDOWS NT

| | | | | | |
|---|-----------|---|------|------------|-------|
| Administering Microsoft Windows NT 4.x | Regularly | 3 | 1035 | Call | QA TR |
| Supporting Windows NT Server 4.x - Enterprise Technologies | Regularly | 5 | 1475 | Call | QA TR |
| Supporting Windows NT 4.x - Core Technologies | Regularly | 5 | 1475 | Call | QA TR |
| Supporting Microsoft Systems Management Server | Regularly | 5 | 1475 | Call | QA TR |
| Supporting Microsoft SNA Server V4 | Regularly | 5 | 1475 | Call | QA TR |
| Windows NT 4.x Essentials | Regularly | 4 | 1395 | Call | QA TR |
| Windows NT 5 Essentials | Regularly | 5 | 1595 | Call | QA TR |
| Supporting Windows NT 4.x Servers | Regularly | 4 | 1395 | Call | QA TR |
| Implementing Windows NT 5 Active Directory | Regularly | 3 | 1045 | Call | QA TR |
| Windows NT Support Fundamentals | 13/07/98 | 3 | 690 | Reading | PTR |
| Windows NT Support Fundamentals | 10/08/98 | 3 | 690 | Reading | PTR |
| Windows NT Support Fundamentals | 07/09/98 | 3 | 690 | Reading | PTR |
| Supporting Windows NT Server | 20/07/98 | 5 | 1150 | Reading | PTR |
| Supporting Windows NT Server | 17/08/98 | 5 | 1150 | Reading | PTR |
| Supporting Windows NT Server | 14/09/98 | 5 | 1150 | Reading | PTR |
| Citrix Winframe | 28/07/98 | 1 | 230 | Reading | PTR |
| Citrix Winframe | 25/07/98 | 1 | 230 | Reading | PTR |
| Citrix Winframe | 29/08/98 | 1 | 230 | Reading | PTR |
| Windows NT 4 Workstation and Server: Hands-on | Bi-weekly | 5 | 1675 | London | LTREE |
| Windows NT 4 Workstation and Server: Hands-on | 21/9/98 | 5 | 1675 | Edinburgh | LTREE |
| Windows NT Optimisation and Troubleshooting | Monthly | 5 | 1675 | London | LTREE |
| Microsoft Transaction Server | Monthly | 4 | 1425 | London | LTREE |
| Porting Applications from UNIX to Windows NT | 18/8/98 | 4 | 1425 | London | LTREE |
| Porting Applications from UNIX to Windows NT | 18/8/98 | 4 | 1425 | London | LTREE |
| Implementing & Supporting Windows NT Server 4.0 | TBA | 5 | 1050 | Manchester | ITS |
| Implementing & Supporting Windows NT Server 4.0 in the Enterprise | TBA | 5 | 1050 | Manchester | ITS |
| System Administration on Microsoft SQL Server 6.5 | TBA | 5 | 1050 | Manchester | ITS |

WINDOWS SUPPORT

| | | | | | |
|--|----------|---|------|------------|-------|
| Supporting Windows '95 | 23/07/98 | 2 | 460 | Reading | PTR |
| Supporting Windows '95 | 20/08/98 | 2 | 460 | Reading | PTR |
| Supporting Windows '95 | 17/09/98 | 2 | 460 | Reading | PTR |
| Implementing Windows NT Security: Hands-on | Monthly | 4 | 1425 | London | LTREE |
| NetWare to Windows NT Integration and Migration | 26/5/98 | 4 | 1425 | London | LTREE |
| Microsoft Systems Management Server | Monthly | 4 | 1425 | London | LTREE |
| Implementing & Supporting Windows 3.1 | TBA | 3 | 650 | Manchester | ITS |
| Implementing & Supporting Windows 3.11 | TBA | 3 | 650 | Manchester | ITS |
| Implementing & Supporting Windows 95 | TBA | 5 | 1050 | Manchester | ITS |
| Implementing & Supporting Windows NT Workstation 4.0 | TBA | 5 | 1050 | Manchester | ITS |
| Implementing & Supporting Microsoft Exchange Server 4.0 | TBA | 5 | 1050 | Manchester | ITS |
| Implementing & Supporting Microsoft Exchange Server 5.0 | TBA | 5 | 1050 | Manchester | ITS |
| Implementing & Supporting Microsoft Exchange Server 5.5 | TBA | 5 | 1050 | Manchester | ITS |
| Internetworking TCP/IP on Windows NT 4.0 | TBA | 5 | 1050 | Manchester | ITS |
| Implementing & Supporting Microsoft Internet Information Server 3.0 & Microsoft Index Server 1.1 | TBA | 3 | 650 | Manchester | ITS |

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Berks to £30k
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VISUAL C++ DEVELOPERS

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JYRA

If the police were like MS technical support

This piece by an unknown author was recently emailed to us...

'Brussels police department, how may I assist you?'
 'Uh... yes... I just got hit in the face with a cream pie.'
 'Okay, sir. Have you called the Brussels police department before?'
 'No'
 'Well, let me get a little information about you for our records.
 Your name?'
 'Bill Gates'
 'Country?'
 'USA'
 'Native language?'
 'English'
 'Okay, sir. Your police department ID number is BP31415927. Please use this number the next time you call. Now, you say you were hit in the face with a pie?'



'Yes, I was just about to meet with the Belgian Prime Minister. One person distracted me while another hit me with a cream pie.'
 'We've had other customers report that they were hit in the face with a custard pie. Are you sure it was a cream pie?'
 'Well, I have white stuff all over my face and I don't see any custard, so I really don't think it was a custard pie.'
 'Have you visited the Prime Minister before?'
 'Yes'
 'Were you hit in the face with a pie then?'
 'No'
 'Hmm... have you visited any other Prime Ministers in the past month?'
 'Yes'
 'Any pies then?'
 'No'
 'Okay, well... let's try something. Go outside the building and come in again. I'll wait.'
 'Just a minute...' <several minutes pass> 'Okay, I'm back.'
 'Did you get hit by another pie?'
 'Of course not'
 'Well sir, I don't know what could have caused the first pie, but it looks like things are working fine now. I'll make a note of the problem, though. If it happens again, please note the exact details of the situation and call us again. Thank you for calling the Brussels Police Department. <click>'

Freebie of the month



Bye-bye Ben Boy

What fashionable developer wouldn't want to spot trains wrapped in the protective impermeability of this stylish yet sensible Microsoft Visual C++ cagoule? The matching Microsoft Visual C++ Thermos, Microsoft Visual C++ lunchbox, and Microsoft Visual C++ train number book (not pictured) complete the whole ensemble. As none of the EXE staff actually indulge in such activities, we are looking forward instead to the arrival of our Microsoft Visual C++ surfboards and Microsoft Visual C++ Board Wax. Yes indeed.

And finally...

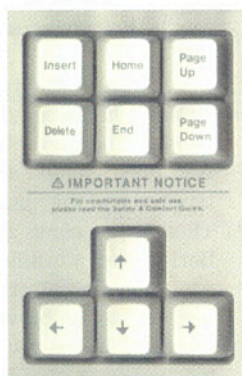
As this photo of the label on a Deskpro 4000 keyboard shows, we think Compaq may be taking the concept of stating the obvious a bit too far. We have some suggestions for their next models:

'For best operation, switch this computer on before use.'

'To avoid injury, please do not put your head through this screen.'

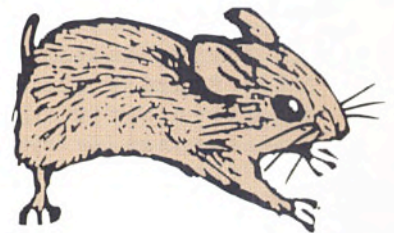
'Warning! Inserting your tongue into the CD-ROM drive may invalidate your warranty.'

If you know of any other examples of labelling lunacy, we'd like to hear about them.



Ask Dr. Gerbil

More advice from our resident rodent on your tricky software development and personal problems.



Q. I'm developing a stocktaking application for my company under Windows CE, but I can't decide whether to use the Visual C++ toolkit or the Visual Basic toolkit. I'm so confused! Can you help? I enclose a picture of myself.

A. This kind of decision is always a hard one, and I can't make it for you. I suggest you spend a few hours running around in your cage, perhaps on the treadmill, or dart to and fro through your expensive plastic-tube artificial warren for a bit. That always clears my head. I also notice from your picture that you don't have a tail. My advice is to grow one. Quickly.

Q. Help! I'm considering using Java for a large, mission critical application. Am I mad? I work for a major bank.

A. As any number of software companies can tell you, Java is a mature, stable technology these days. Why, only a few moments ago the readers of this magazine would have refused to believe that a gerbil could be a software development expert, yet now they accept it without question. So no, you're not mad. Just very, very gullible. I suggest you spend a few hours running around in your cage, perhaps on the treadmill...

Next month: 'My wife ran off with another hamster and I don't understand pointers!'

Yocam hokum

Borland has changed its name to 'Inprise'.



Del Yoc-am's accession

1. And it came to pass *that* the sons of Kahn known as the Borland-ites, who dwelt in the valley of Scotts, were once more sore oppressed.
2. For the Borland-ites had toiled many days and nights over Delphi, and had made it good. *Yet* the people thereabouts would try it not, saying: *What* kind of a thing is *this* Delphi? Is it Eye-tie-ite or something? We do better to buy things that are called Vi Su-Albaisic or Power or Bill-da or C++ or Enterprise, *which* art as the pie of the apple.
3. Then the Borland-ites had toiled many days and nights over C++ Bill-da, and had made it reasonable. Yet the people thereabouts would try it not, saying: How does this help with our Java strategy?
4. And to cap it all, the Mic-rosoftees of the north had encamped at the very entrance to the valley, *whence* they did ensnare Borland-ite programmers in nets, and dragged them off to Red Mond to eat them.
5. Wherefore things looked pretty bleak, even by the standards of the Borland-ites.
6. So the sons of Kahn decided to take *unto* themselves a new leader. For they spake *amongst* themselves saying: Whosoever we choose can't make things any worse.
7. Now one day there came unto their midst a man, *whose* name was Del Yoc-am. And the Borland-ites called out to *this* man: What knowest thou of the craft of software?
8. And Yoc-am replied saying: Nothing. I'm a hardware guy, me.
9. And the Borland-ites asked this man: So thou hast no desire to drop zillions on over-valued piles like Ash-Tontate, or launch truly hopeless packages *like* Object Builder, or plan to grow a huge hedge in the shape of Stonehenge?
10. And Yoc-am replied saying: No indeedly.
11. And the Borland-ites cried out in joy saying, Here is our new leader. And they carried him *up* the valley on *their* shoulders, and put him upon their throne, and put on *his* back the grey cloth of leadership, and anointed *his* feet with laser toner of the very best quality.
12. And they sung a song in *his* honour:
13. Hail to the chief! For his name is Del Yoc-am.
If you hear some wise words brief
'Twas surely he who spoke 'em.



The acts of Yoc-am

1. So it was that Del Yoc-am reigned *over* the Borland-ites. And he reigned for three score weeks and ten. And in this time he restrained himself from buying *up* software houses, excepting the odd small one *which* counteth not, and did not release any utter boners, although JBuilder 1 was perhaps one which they will be keeping a little quiet about in years to come, and grew no hedges in the shape of an ancient monument of Wilt-shire, *as far* as we know.
2. And Yoc-am made Enterprise versions, which art not so very dissimilar *from* ordinary versions, except that *they* hath a little stick-er upon the box, and they cost one hundred-fold more. For Yoc-am reasoned thus: if we manage to sell a couple of these, we can pay off the mortgage.
3. And Yoc-am engaged *with* Mic-rosoftees of the north, and parleyed



with them, and made *them* promise to stop eating the programmers of the Borland-ites.

4. And the Nasdaq looked down *upon* the labours of Yoc-am, and saw that *they* were not too bad, and the price of the stock of the Borland-ites, which had been on the floor, crept upward a little.
5. And the morale of the Borland-ites improved.
6. But Yoc-am became sore troubled in his heart. For he noticed *that whenever* he made a pitch to the Corporates, they did snigger unto him saying: How art the hedges, O Borland-ite?
7. And when he heard this, Yoc-am waxed full of wrath. And he determined to do something about it.
8. So one day, Yoc-am called the sons of Kahn unto him, and he said: I have a great idea *that* will fix *this* hedge *thing*. Let's change our name.
9. And the sons of Kahn said unto him: No, that is a silly idea. Let's not.
10. And Yoc-am replied saying: Too late. I have already ordered the stationery, and the press are coming round in ten minutes.
11. And the sons of Kahn spake, saying: Oh. And *what* are we to be called?
12. And Yoc-am said *unto* them: Inprise.
13. And the sons of Kahn gasped, saying: What?
14. And Yoc-am said *unto* them: Sorry. I actually meant to call us 'Enterprise', but it was a bad line and the lady was a bit deaf, and I think I may have been a bit tipsy.
15. And the sons of Kahn cried out *unto* him saying: *You utter burke*.
16. And the Inprise-ites that had been Borland-ites did lament a loud lament:
17. O woe! Tears fill our eyes
It seems for sure that folk'll
Just laugh at our Inprise.
Del Yoc-am is an anagram of Mad Yokel
Nearly.



The consequences

1. And when the Mic-rosoftees of the north heard *what* had happened, how they did laugh. They laughed and they laughed and they laughed and they laughed and they laughed and they laughed and they laughed.
2. And they laughed and they laughed and they laughed and they laughed and they laughed and they [that's enough laughing - Ed].
3. Then there came forth from the tribe of the Until-Recently-Borland-ites a techie. And the techie's name *was* Char Leecalvert.
4. And Char Leecalvert went unto to the mountain top *called* Internet, and spoke brave words unto the world, saying: it doth not matter; Borland-ite is but only a name, like any other; by all means have a giggle at our marketing people – they hath always been dodgy anyway – but our technology is still cool.
5. But friends of the Inprise-ites *that* had been Borland-ites once more had cause to remember the wisdom of the great prophet M'andee-rice Davis. And *such* men were again sore afraid *for* the sons of Kahn.



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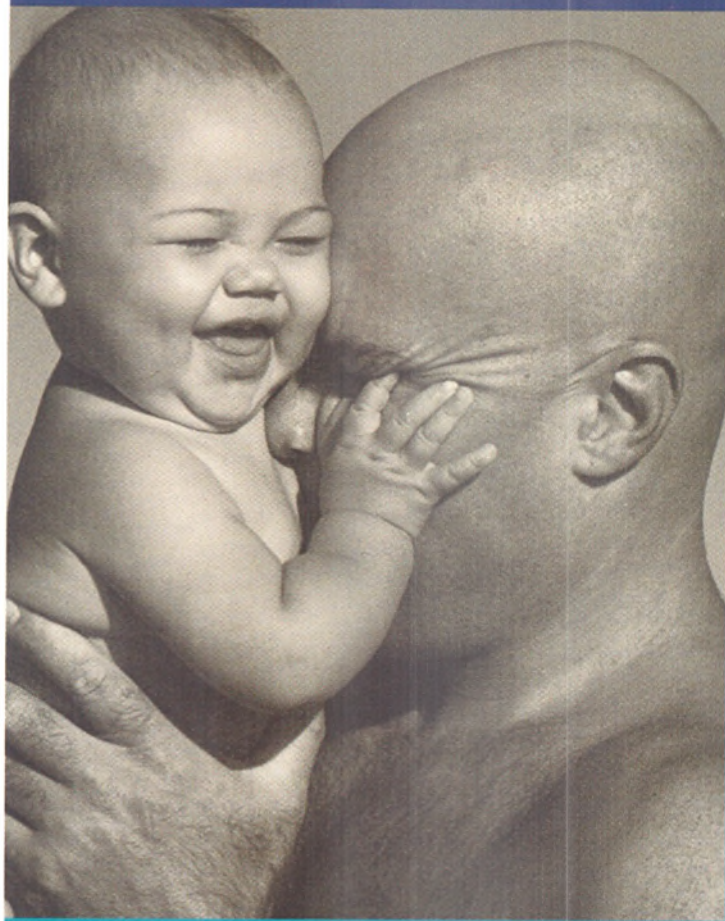


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