

# EXE

JUNE 1999

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## Think about frameworks

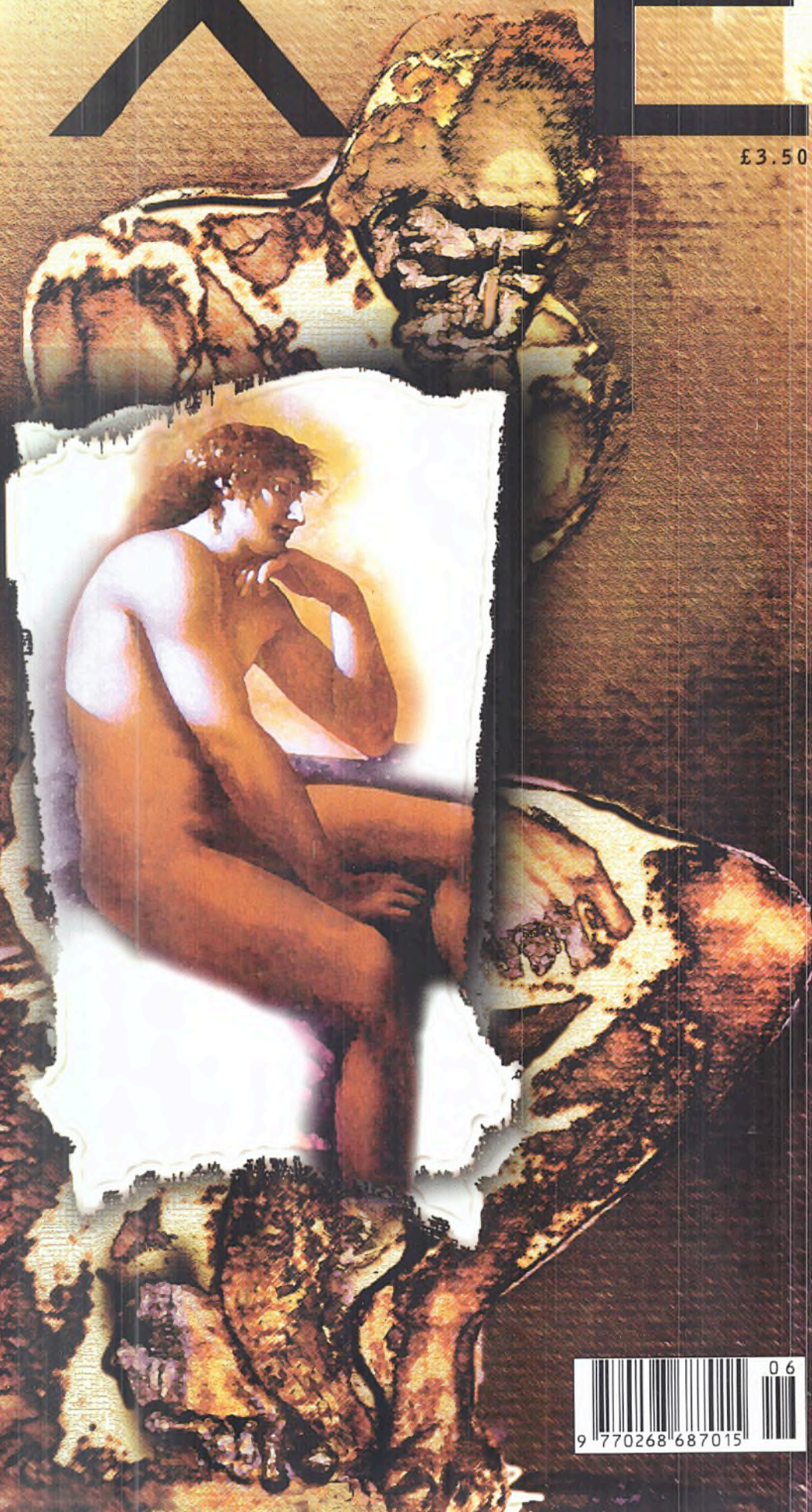
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## news

### InstallDialogue

#### Customise InstallShield Dialogues

InstallDialogue by Moonsea Software comprises of an editor and a runtime library. The visual editor designs the layout of your dialogue, the runtime library consists of about 140 functions to let you create powerful custom dialogues. Extend the functionality of your own created custom dialogues or InstallShield dialogues.

### Tracker Pro

#### Powerful cure for information overload

Enfish Tracker Pro works like an intelligent assistant, organising and filing everything on your computer, helping you find exactly what you need, when you need it. Automatically groups your related emails, files and Web pages by whatever is important to you. View the contents of your emails, files and Web pages instantly, without launching any other program.

### GIF Movie Gear

#### Quick and easy Gif animation

GIF Movie Gear from gamani productions makes building GIF animations easy with an intuitive interface based on a filmstrip metaphor that shows all the frames at once. It also provides powerful palette reduction and inter-frame optimisation functions to shrink animation files down to Web-friendly sizes.

### Modern GuardX 2.0

#### Take control of your users

Users delete files, corrupt data, and see things they shouldn't. But GuardX lets you control what users of your software can do! The latest version supports Windows NT account validation, Windows network integration, unlimited groups and group memberships and user policies.

### Solutions::Explorer 1.0

#### Save hours of programming time

Solutions::Explorer is a collection of OLE components, from dbi technologies inc., designed to help you add data mining, help system, or explorer type capabilities to your 32-bit Windows applications.

### WinWedge Pro

Connect any instrument to your PC serial port and directly input the data into any application.

WinWedge is a fully customisable serial I/O device driver that inputs real-time data from instruments directly into spreadsheets, databases, stats, packages, LIMS, MMIs and other applications.

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Have any of your customers rung your tech support saying that your software has stopped working or is behaving strangely or is suddenly causing GPFs? The most likely cause is that one of your supporting DLLs has been overwritten by another program (according to some research, 90% of GPFs are caused by this). Why is this such a problem and is there anything we can do to prevent it?

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[www.greymatter.co.uk/thinktank](http://www.greymatter.co.uk/thinktank)

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## software

### Windows

|                              |      |
|------------------------------|------|
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| Codewright Pro               | £164 |
| DevPartner Studio            | £839 |
| DMX Developer                | £125 |
| Doc-To-Help 4.0              | £319 |
| FormatterOne for DVD NT      | £66  |
| GP-Version 5.0               | £199 |
| Help Magician Pro            | £185 |
| InstallShield Pro            | £492 |
| LEADTOOLS Imaging            | £317 |
| MultLang Suite 2.1           | £599 |
| MKS Toolkit 6.1 w/sub        | £318 |
| RoboHELP Office 7.0          | £626 |
| SafeSerial OCX Professional  | £175 |
| SOFTLOCX Professional        | £179 |
| SourceOffSite                | £99  |
| True DBSuite                 | £449 |
| Visual UML                   | £299 |
| Wise InstallBuilder          | £257 |

### Web

|                                   |      |
|-----------------------------------|------|
| Agile HTML Editor                 | £49  |
| Art-O-Matic                       | £13  |
| Chart FX Internet Edition         | £460 |
| ColdFusion Application Server Pro | £949 |
| Coolpage                          | £21  |
| English Wizard Expose             | £585 |
| ForeHTML 3.0 Pro                  | £210 |
| GDlib 5.0 Pro Commercial          | £130 |
| GIF Movie Gear                    | £25  |
| HoTMetaL PRO                      | £98  |
| Ignite Web Graphics Optimiser     | £50  |
| InstallFromTheWeb                 | £260 |
| PaintShop Pro                     | £79  |
| Sound Forge                       | £300 |
| URL Live! Development Suite       | £449 |
| VideoSoft VSFORUM                 | £296 |
| Visual Café for Java Professional | £196 |
| Xbase-On-The-Web                  | £178 |
| WebTrends Log Analyser 4.5        | £280 |

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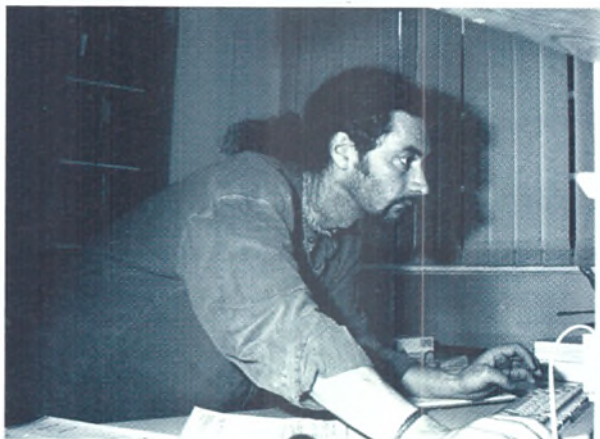
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# A small footprint



**H**andheld devices, or Personal Digital Assistants (PDAs), represent the next stage in the continuing decentralisation of enterprise computing. From the monolithic 'glass houses' through client/server environments to the rise in remote working and notebook computing, today's 'ubiquitous enterprise' is more accessible and wide-ranging than ever before. In order for the corporate network to support and interoperate with the multifarious devices being used in the field, developers are again turning to Java for the answers.

Being platform-independent, Java provides excellent support for the many different real-time operating systems that are embedded in PDAs. Many developers maintain that the language offers a fluid, symbiotic environment in which PDAs can be enhanced and adapted to suit enterprise requirements. However, the core issue lies in consolidating these requirements with the hardware limitations of the PDAs themselves.

Limited processor power and memory have restricted the range of enterprise applications that could be supported in the mobile environment. Consequently, developers have looked to software for a solution. Central to this are two fundamental considerations: the real-time operating system and application size.

The key to the puzzle is the underlying database that supports both the operating system and the management of



application data. Due to the persistent storage required in PDAs to deploy enterprise applications, the embedded database market is today the most active sector of the database industry. Java developers realise that small-footprint embedded databases are the way forward, as these require no administration and they are optimised to run on low memory.

The aim is to minimise the overall size of PDA applications in order to maximise functionality. However, the success a developer has in achieving this is subject to the type of footprint database chosen. Why? Because this affects the amount of code needed to manipulate application data.

Before the arrival of multimedia, the relational database model was the dominant architecture for data processing and data management. But, as data has taken on a three-dimensional aspect, relational databases have struggled to maintain processing speeds. This is due to the sizeable mapping code necessary to deconstruct and store complex data and the 'joins' needed to reconstruct the data at runtime.

Consequently, pure object databases have risen in popularity as a means to clear away this 'excess baggage'. Since they can deal with complex data in its native form, there is no mapping code with object databases. When it comes to embedded applications in low-memory environments, object technology makes good sense.



Even once technology overcomes current hardware constraints, the financial benefits in terms of productivity and memory savings are self-evident. Perhaps the most compelling advantage that embedded object databases have over relational databases, however,

is their native support for the Java language.

Of course, relational databases can adapt to offer support for Java and multimedia data via JDBC and other integration techniques, but these always carry a cost and, in the case of PDAs, this cost is difficult to compensate. Object databases by nature are highly portable, faster than relational equivalents by orders of magnitude, and can cut application development time in half. Why should we bother to adapt a technology if it is obviously not suited to the task?

Relational databases may wipe the floor when it comes to alphanumeric data processing because that is what they were designed for. However, as technology diversifies, it's unreasonable to expect that one solution will suit every situation.

When it comes to the mobile environment and PDAs, the relational vendors are fighting hard. But technology speaks for itself, and for developers working in the embedded world, the pure object, pure Java database is a combination increasingly hard to ignore. ■

*Jim Beagle  
Object Design*





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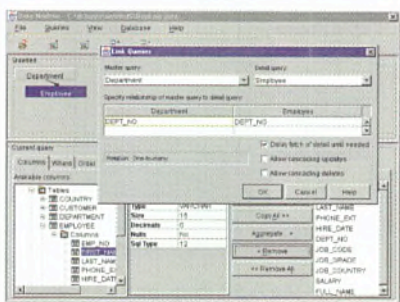
# Borland builds on the Java 2 platform

Following the release of C++Builder 4 in February, JBuilder 3 represents the second major release from Borland, this year. Main features in this version include support for the Java 2 platform and tools for distributed development and deployment. As well as the visual tools for creating Java applications, applets, servlets, Enterprise JavaBeans, and distributed Corba applications, over 300 JavaBeans components are provided, with source. Remote and multi-JDK debugging is also supported.

Visual database development tools for Java 2 include the Application Generator, Data Modeler (pictured), Java SQL Builder, and Java JDBC Explorer. Visual tools for Corba development, as well as the Application Generator and the Data Modeler, include an ORB Explorer. Integrated Corba development is available using either VisiBroker 3.4 or OrbixWeb. The Enterprise edition includes Interbase, Borland's embedded database product. Finally, the JBuilder 3 Companion CD contains full or lite versions of third-party applications that

can be used in conjunction with JBuilder (but see *C++Builder 4—the construction continues*, EXE, April 1999, which questions the fullness of the utilities on the sister product's Companion Tools CD).

Many of the tools on the companion CD are integrated into the JBuilder environment via its Open



Tools API. This open environment supports JDK 1.1.x, JFC/Swing components, Enterprise JavaBeans, Corba, RMI, JDBC, and the major corporate database servers.

JBuilder 3 will be available in three versions: Standard, Professional, and Enterprise. A matrix of features across the editions can be found on the Web. The schedule for JBuilder 3 platform support is as fol-

lows. The initial Windows version should be available in the UK by June, on Solaris before the end of the year, and finally, on Linux sometime following the Solaris platform release. The reason for the delay for non-Windows platforms is that part of the product (mostly the GUI) is still written in Delphi. Borland will complete the full Java rewrite of JBuilder with the Solaris version. A new Windows version will be released at the same time. If Borland succeeds in writing JBuilder as a pure Java app, then Linux, AIX, and any platform with a JVM should be supported at the same time.

JBuilder 3 Standard has an ESP of £84, JBuilder 3 Professional £499, and JBuilder Enterprise £1,699. Current owners of any Borland product can purchase the Enterprise edition for an ESP of £1,199 and the Professional edition for £249.

Borland claims that with the release of JBuilder 2 its market share grew at a faster rate than any other Java development tool.

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

**JProbe** Suite 2.0 is a set of tools to help you debug thread, memory, and performance problems in Java applications. KL Group's suite comprises Profiler, Memory Debugger, Threadalyzer, and Coverage. It can analyse applications written using JDK 1.1 and Java 2, and run on Windows 9x and NT and Solaris. It is available in two editions: Developer and Professional.

[www.pts.com/static/jprobe.html](http://www.pts.com/static/jprobe.html)

The **Microsoft** XML Parser is freely available for download and distribution. It's compliant with the W3C XML 1.0 Specification. Programmable by Java, Perl, Python and SQL, as well as VB and VC++, it supports DOM and the XSL working draft.

[msdn.microsoft.com/xml/](http://msdn.microsoft.com/xml/)

**PowerTier** for Enterprise JavaBeans is an EJB application server, designed to simplify the development and deployment of distributed applications. It supports Java 2 and is available as a Development Kit and a Deployment Server. For Solaris, Windows NT, HP-UX, and IBM AIX.

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

## Oracle goes all XML

XML seems to be gathering momentum; Oracle has announced a complete server infrastructure, based on XML, for the exchange and management of business information. It is working on message broker capabilities that will be combined with its Internet platform – Oracle8i, Oracle Application Server, and Oracle Tools. The idea is to simplify the integration of XML with database data, and extend the power of database queries to XML.

The immediate result is XML support in Oracle8i in the form of an XML Parser. This will support the storage and reconstruction of XML documents to and from the database. Following on from this at a later date, the XML-enabled message broker capabilities will provide an infrastructure to intelligently process, and route XML-based information.

Oracle claims that while XML content that resides in filesystems as static documents is difficult to manage and search, by storing XML data in the database companies can increase its usefulness. There will also be benefits of database security and replication for easier administration. Oracle 8i's core XML support will make it possible to build applications that store XML in the database as either documents or data and that publish XML documents from existing data and queries.

Oracle is involved in the W3C process to define XML standards, and in many of the XML Working Groups.

[www.oracle.com/xml/](http://www.oracle.com/xml/)

## ObjectStore 6.0

ObjectStore 6.0 is a data management system targeted at e-business applications. This version includes features to support deployment as a data server, where it can be used in the middle tier of an application to re-present data in formats compatible with Java, C++, and web applications.

Version 6.0 sees integration with Enterprise JavaBeans application servers, including an EJB container for BEA's WebLogic 4.0 EJB server. In addition, Java caching and clustering technologies have been built into the engine of ObjectStore to increase performance for enterprise Java applications.

Platforms supported include Windows 98 and NT and the major Unix environments. ObjectStore 6.0 is priced at \$4,500.

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

Version 1.2.1 of **Software AG's** Bolero development environment features changes to its Component Studio. There is the use of design patterns, Long Transactions (the coordinated execution of inter-related business tasks), and an improvement of object to relational mapping. The **Bolero** language has also been revised

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

**Forté** is shipping a beta version of its new Java suite, SynerJ. The SynerJ Developer is a standalone IDE for creating Pure Java enterprise apps, and SynerJ Server is an EJB deployment environment, supporting all Java 2-compliant JVMs.

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



# Data source to XML with ASP2XML

A beta version of **VisualAge** for Embedded Systems (**Java** Technology Edition) can be downloaded from the Web. It's the first of many products that IBM will deliver in 1999 to help prepare for 'pervasive computing', its strategy for extending the power of the Internet to a new generation of **devices**.

[www.ibm.com/embedded/](http://www.ibm.com/embedded/)

**Oracle's** Application Server version 4.0.8 entered beta in May and features extended **Java** support. It adds Enterprise **JavaBeans** (EJB), **Java** Servlets, and **Java** Server Pages. It continues to support C++, Cobol, and Perl applications. The beta can be downloaded from the Oracle Technology Network.

[technet.oracle.com](http://technet.oracle.com)

**DbCAD dev** V1.5 by Abaco allows VB, Delphi, and C++ developers to extend applications to support GIS, **GPS**, and CAD. In addition to graphic-manipulation features, it provides tools for database integration, and enables **spatial** analysis and querying. The ActiveX costs £129 (10 run-time licences costing £275).

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

**TOPLink for Java** V2.0 is an object/relational mapping tool from The Object People. It's a transparent framework for **Java** access to data stored in **relational** databases. This release sees **Java2** support (private variable access, scrollable cursors, and collection support), performance optimisations, and Oracle 8i-specific features.

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

**Trident Search Site Server for Java** is search-engine software written in 100% Pure **Java** (for JDK 1.1). It's capable of indexing, **searching**, and retrieving information from the **hypertext** and text documents stored on web servers.

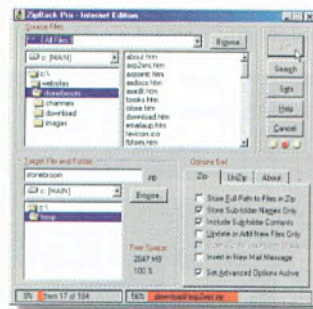
[www.noviforum.si](http://www.noviforum.si)

There are four new components from Stonebroom Software: ASP2XML V1.11, an ActiveX which provides an interface between ODBC and OLE-DB - compliant data sources and XML-enabled clients; SaveForm V1.0, a series of methods to persist ASP `Request.Form` data between user sessions; ServerZip V2.03, an Active Server component that provides Zip-related functionality over the Web; and ZipBack Pro Internet Edition V32.03 (pictured), a 32-bit version of the Zip file manager which includes email integration.

ASP2XML V1.11 works with data sources for which an ODBC or OLE-DB driver is available. It creates XML-formatted documents from the data, which can be parsed, interpreted, and edited by XML-enabled client applications. The edited XML document can then be posted back to the component on the server, where it will automatically update the source data. Stonebroom claims

that data integrity is automatically maintained in multi-user environments, including users concurrently updating the same set of records.

SaveForm V1.0 provides three methods related to ASP forms. First, it allows you to save the con-



tents of the ASP `Request.Form` collection in the user's session. Second, you can persist these values to a text file or database, or send them as an email message. Third, it's possible to retrieve individual values on demand, retrieve the set of data back into the user's

session, and access values for any user or page on demand.

Zip functionality on a server, over the Web, is provided by ServerZip V2.03. It provides users with selected listings of files on a server, within a web page in their browser. Developers can add custom text and HTML to the listing to create a range of output formats. The trade-off between compression rate and speed can be controlled to optimise usability depending on file type and size.

For the Internet Edition of the ZipBack Pro archive tool, new features include sending zip files direct to email clients, and controlled virus scanning of unzipped files.

ComponentSource retails the ASP2XML V1.11 single-user licences at £55, SaveForm V1.0 single-user licences at £55, ServerZip V2.03 single-user licences at £45, and ZipBack Pro Internet Edition V32.03 single-user licences at £17.

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

## Defect tracking the rational way

There's a new web interface for ClearDDTS, Rational's Unix-based defect tracking system. Version 4.5 also sees database synchronisation capabilities for distributed teams, and more flexible access control options.

The updated web interface uses a single approach for querying, reporting, and editing saved entries. There are user-defined field defaults, there is text wrapping in enclosures, and field-level online help. In addition, some functionality of the X Window interface has been incorporated.

For distributed teams, Version 4.5 synchronises the work of multiple people in multiple locations. When a conflicting change is made simultaneously at two or more sites, the system will flag the change, save the work, and notify the appropriate people of the conflict. Other features include the system detecting when defects exist at a remote site that are no longer present at the home site, and the broadcast of changes to all connected sites.

In terms of access control options, this version allows administrators to create groups that define access rights for both local and remote users, so there is no need to change users' Unix permissions to change their access to ClearDDTS. Additionally, administrators may determine read/write access control for a project, state change, or individual field. For example, only users with certain permissions may be able to modify the status of particular defects.

Rational ClearDDTS supports Sun Solaris 2.5, 2.5.1, 2.6, 7; HP-UX 10.20, 11.00; DEC OSF1 4.0d; IBM AIX 4.2x; and SGI IRIX 6.2, 6.4. And Microsoft IE 4.0+, Netscape Navigator 3.0+, Apache 1.2, 1.3.4, and Netscape Enterprise 3.0, 3.01, 3.6.

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

## HAHTsite 4.0

The HAHTsite Application Server has been upgraded. Major features of version 4.0 include support for 100% **Java** projects (or a mix of **Java** and HAHTtalk Basic, which is based on VB), minimal downtime for planned maintenance using phased shutdown of clustered servers together with hot upgrades and live reconfiguration, and the inclusion of VisiBroker so that HAHTsite can act as both a Corba client and a Corba server. Application partitioning and reuse is supported for large applications. Security enhancements include failover with no single point of failure, and fine-grained, role-based security for all page objects together with DES encrypted communication through a firewall.

Available from Contemporary, the Integrated Development Environment costs £1,250 per seat, the Integrated Publisher £450 per seat, and the Application Server Starter Pack for NT, Solaris, HP-UX, and IBM AIX costs £4,700.

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





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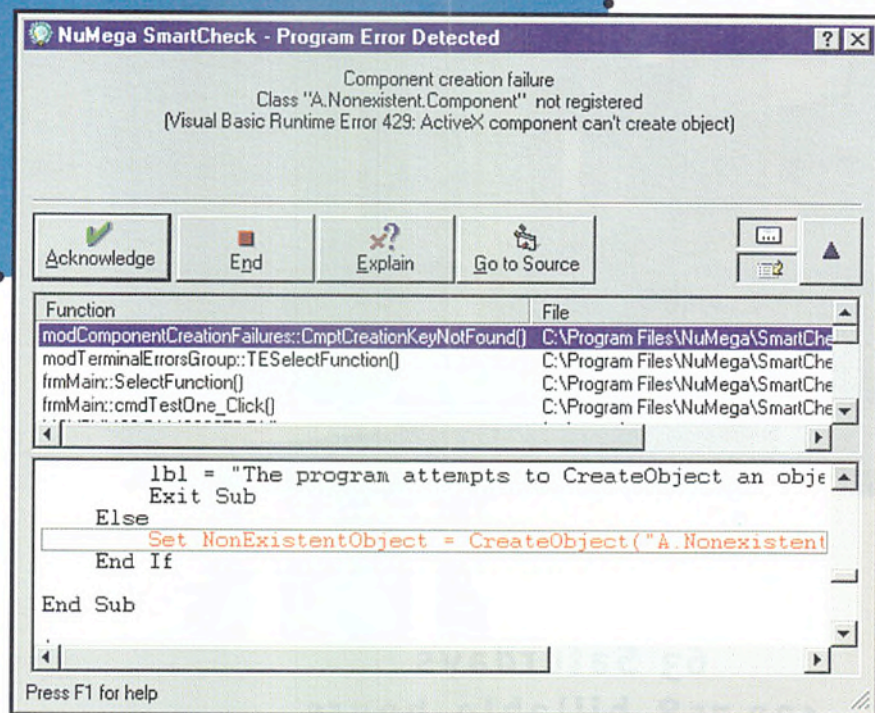
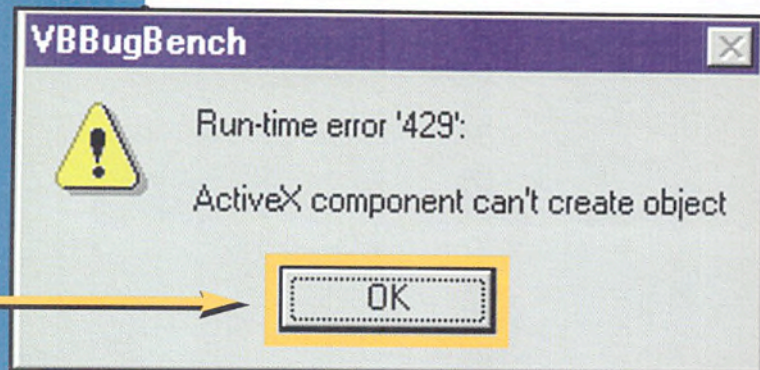


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# Web Data Windows from Sybase

PowerJ 3.0 and the 4GL PowerBuilder 7.0 are in Sybase's Enterprise Application Studio 3.0 (EASstudio), its set of integrated Web application development and deployment products. This release also includes the Enterprise Application Server 3.0 (EAServer) and sees the introduction of Web Data Windows technology, which together with EAServer enables the point and click construction of thin-client Internet apps.

Features of EASstudio 3.0 include a new user interface for PowerBuilder, and native PowerBuilder component support in EAServer. There is automatic deployment of PowerBuilder and Java components to EAServer, together with their remote debug-

ging. EAServer also provides Application Integrators for access to CICS and stored procedures. Finally, the latest Java developments, represented by Java 2, are catered for by PowerJ 3.0.

The Web Data Windows are designed to provide a no-coding solution for building ultra-thin client e-business applications. Developers use the graphical tool, within PowerJ or PowerBuilder, to 'paint' client windows. The Web Data Window clients support data editing, deletion, validation, formatting, and browsing. When deployed, a Web Data Window component running in EAServer will automatically generate the HTML and JavaScript required to run the user interface and to manage the data via a browser.

The same Data Window business logic can be reused for PowerJ and PowerBuilder.

EAServer 3.0 has high-availability features for clustering and load balancing, and there is added support for SSL capabilities.

Web Data Window is included with EASstudio 3.0, PowerBuilder 7.0, and PowerJ 3.0, and these products are for Windows 9x and NT.

This release sees a reduction in price for PowerJ 3.0: the RRP is \$595 per developer, as opposed to \$1,995 previously. PowerBuilder 7.0 is \$4,295 per developer, and the pricing for EAServer 3.0 starts at \$2,995. The Studio suite is \$4,797 per developer.

[www.sybase.com/products/eastudio/](http://www.sybase.com/products/eastudio/)

**Embarcadero** Europe has launched **Schema Manager 1.0**, which allows you to archive, compare, synchronise, and migrate **database** schemas on Oracle, Sybase, Microsoft SQL Server, and DB2 Universal Databases. Costing £1,109, a free evaluation is available from the Web.  
[www.embarcadero.com](http://www.embarcadero.com)

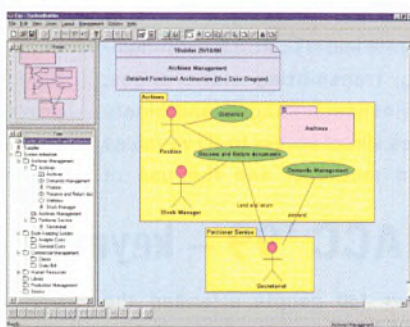
**Assent** is a tool for checking code compliance with **MISRA-C**, the motor industry-sponsored guidelines for the use of C in **safety**-related systems. The tool uses a browser-based interface, and is available from Praxis Critical Systems.  
[www.praxis-cs.co.uk](http://www.praxis-cs.co.uk)

## UML modelling and prototyping with TBuilder

UML modelling and automatic prototyping is provided by **TBuilder V1.0**, from Concis Technologies. Working to **OMG's UML V1.1**, the tool models Class, Use Case, Statechart, Activity, and Sequence Diagrams. System Architecture and Macro Class Diagrams are also supported. The tool is capable of generating a UML project into a Windows application, for more effective validation by end-users. Details of the GUI can be customised and user profiles can be specified. There are some reverse-engineering capabilities.

For team development, each developer can model a part of a project. The results are consolidated in a global, graphical dictionary. This can produce two views for a developer: the model of the project in its entirety and the model on a per-developer basis.

For the cause of object reuse, a graphical library stores specified objects for subsequent use. 'Intra-domain' business objects, as well as generic objects, can be stored together with their graphical representa-



tion for easier identification. The system runs on Windows 9x and NT, and it will be launched at Application Development '99, in London in July. It costs £1,390.

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

**ProDelphi V6.2** measures the runtime of **Delphi** functions in CPU-cycles. This version can support conditional compilation, the use of DLLs (static and dynamic linking), and code can be excluded from **profiling** with the inclusion of special comments. Costing \$50, a free-ware version is available.  
[www.hp.Europe.de/prodelphi/](http://www.hp.Europe.de/prodelphi/)

Pacific Gold Coast's **InstallConstruct V3.1** is a suite of wizards and tools for creating Windows 3.x, 9x, and NT installers and uninstallers. Internet and intranet distribution is supported. V3.1 features customisation of graphics and 3D logo text. It costs \$199.  
[www.pgcc.com](http://www.pgcc.com)

## Performance Studio - testing the load of e-business

How many people will access your website on a given day, and do you have the resources to match? Rational PerformanceStudio V7.1 is designed to help identify potential performance bottlenecks, integrating end-user response-time data with network and server-resource accounting data. It provides load-testing support for client/server and ERP applications, as well as those on the Web. This version sees a particular targeting of e-commerce

applications: there is support for SSL2 and SSL3 encryption, SAP R/3 version 4 for validating R/3 implementations, and also BEA's Jolt transaction protocol for testing n-tiered web and Java apps.

Four SmartTesting capabilities have been introduced: DataSmart Recording, LoadSmart Scheduling, ClientSmart Pacing, and Server Smart Playback. First, DataSmart Recording automates the use of multiple transactions from a test

script; LoadSmart Scheduling automates the creation of workloads for a number of users; ClientSmart Pacing automates the insertion of timing characteristics. Finally, ServerSmart Playback is designed to ensure the integrity of the results being produced.

For Windows (3.1, 9x, and NT) and Unix (Sun Solaris, HP-UX, and IBM AIX), price is dependent on platform and configuration.

[www.pts.com/static/perstud.html](http://www.pts.com/static/perstud.html)

**InstallAnywhere 2.5**, a system for multi-platform deployment, enables **Java** developers to build installers for Windows 9x and NT, **Unix**, and Mac OS. This version sees an enhanced installation engine, a simplified Web Installer process, and a SpeedFolders feature, which treats multiple files and folders as a single object. InstallAnywhere is licensed on a per developer seat basis. The standard edition costs \$995.  
[www.zerog.com](http://www.zerog.com)



## Speeding with a 4D database

**Astra SiteManager v2.0** is available for free download. **Mercury Interactive's** website management tool features the creation of customised HTML-based reports including page analysis, the scheduling of unattended **website** scans for broken links, a new browser view embedded within the tool, a spell checker, and the prediction of download times for a preview of website performance prior to deployment. For Windows 9x and NT. [www.merc-int.com](http://www.merc-int.com)

For embedded programmers, **CAD-UL** has extended its tool suite for x86 Protected Mode with a **Graphical Linker**. It's a visual tool for describing hardware **memory** layout interactively. Once the layout is designed, you can place the objects of an application in the specific memory regions via drag and drop. For Windows 95 and NT. An Object Explorer displays all the objects of the design in a hierarchical tree. [www.cadul.com](http://www.cadul.com)

Access to **legacy** systems via a Windows CE **emulation** is provided by Pericom Software. Its *teemtalk* range of emulation software has been expanded to include a terminal emulation product for **Windows CE** environments. The *teemtalk* CE includes keyboard mapping, mouse integration, full print capabilities, and soft buttons. [www.pericom.co.uk](http://www.pericom.co.uk)

Optimisations are the main feature of version 6.5 of ACI's 4th Dimension (4D), which is a graphical relational database development system. As well as a faster indexing algorithm, the new network components serve to compact data for faster transfers between client and server. Other improvements involve multi-criteria searching and sorting in sequential mode, the deletion of records, and the management of data with large numbers of repeated values. The idea is that with an integrated Web server, 4D gives you one development language where others tools may require skills in SQL, a 4GL, and some middleware.

4D 6.5's Web server is designed to allow the integration of database solutions with the Web. The Static Pages Server supports the following: the use of frames and HTML 3.2; multi-homing; transmitting static pages, stylesheets, images, and binary files; direct access to 4D variables and methods; and the use of

logged statistics. The Web server is fully controllable from the 4D language. The Dynamic Pages Server supports the translation of 4D forms into HTML 3.2 on the fly, and the use of DHTML.

4D Write is the word-processing program for the system. In version 6.5 this has been completely

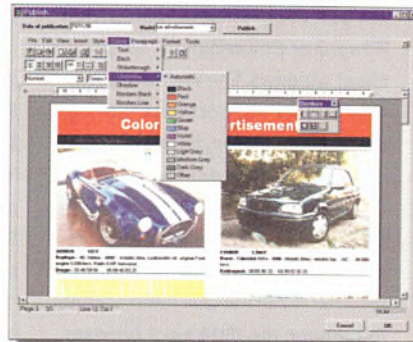
and export assistant, and the provision of new interface objects.

For developers, 4D 6.5 apparently has more than 130 new features. These include over 75 extra Internet-related commands, the automation of sending and receiving of email and files (via FTP), and specified on-client execution, which will allow you to execute a method on a registered 4D client or several registered 4D clients.

The system includes a cross-platform Image Editor, which allows you to create icons and animated graphics. The Runtime Explorer allows you to view the behaviour of the different structural elements in the database (processes, variables, tables and fields, cache, etc) and to verify the use of available resources. It is available in compiled or interpreted mode. Finally, a new Find Editor allows you to search for a string in the entire database.

The 4D Standard Edition costs £195 and the 4D Developer Edition £495.

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



rewritten, with a new UI and features that include the use of stylesheets, frames, and facilities for importing and exporting in multiple formats. It is part of the improved application functionality for end-users, other features being the Interface splitters, an import

## JACC '99 – keynote and endnote

Over 140 people attended the JACC '99 seminars at the Oxford Union on April 17, surpassing the expectations of the organisers.

The keynote talk, given by Bjarne Stroustrup, was entitled 'What is an object?'. The theme that emerged was the importance of a considered approach to the evalua-

tion of the usefulness, or cost, of any given object: 'object-oriented' does not simply mean 'good'. This principle was further developed by Francis Glassborow's endnote. He stressed the value for programmers to be familiar with a range of programming languages and idioms, particularly those that were not di-

rectly related to work at hand, emphasising the distinction between learning to understand how to solve a problem and being trained to use a particular tool.

The JACC seminars were organised by ACCU in association with EXE Magazine.

[www.accu.org](http://www.accu.org)

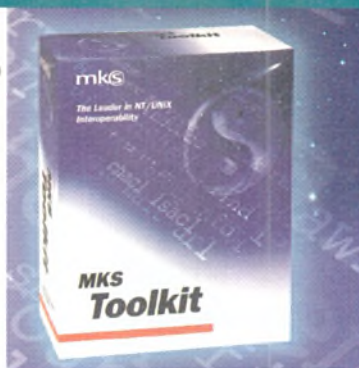
## Books received this month

| Publisher            | Title                                      | Author                               | ISBN          | RRP    |
|----------------------|--|--------------------------------------|---------------|--------|
| Wrox Press           | ADSI CDO programming with ASP              | M. Freidnitz & T. Mondor             | 1-861001-90-8 | £45.99 |
| O'Reilly             | Apache – the definitive guide              | Ben Laurie & Peter Laurie            | 1-56592-500-9 | £23.50 |
| John Wiley & Sons    | Building distributed applications with ADO | W. Martinier, D. Herion, & J. Falino | 0-471-31701-2 | £25.95 |
| Morgan Kaufmann      | Data preparation for data mining           | Dorian Pyle                          | 1-55860-529-0 | £34.95 |
| John Wiley & Sons    | Fast track web programming                 | Dave Cintron                         | 0-471-32426-4 | £25.95 |
| John Wiley & Sons    | Improving data warehouses                  | Larry P. English                     | 0-471-25383-9 | £29.50 |
| O'Reilly             | Java threads (2nd Ed. for Java 2)          | Scott Oaks & Henry Wong              | 1-56592-418-5 | £21.95 |
| O'Reilly             | Python pocket reference                    | Mark Lutz                            | 1-56592-500-9 | £4.50  |
| Cambridge Uni. Press | The mathematica book (4th Ed.)             | Stephen Wolfram                      | 0-521-64314-7 | £35.00 |
| AP Professional      | Unix clearly explained                     | Richard L. Petersen                  | 0-12-552130-8 | £29.95 |
| O'Reilly             | Web design in a nutshell                   | Jennifer Niederst                    | 1-56592-515-7 | £15.95 |
| Wrox Press           | XML IE5 programmer's reference             | Alex Homer                           | 1-861001-57-6 | £27.49 |



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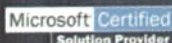
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# Cool, sexy, old

Jules looks at the current IT skills shortage and discovers that there's worse to come.

The skills shortage in IT is becoming a bit of a problem. Not for us, you understand; we are the people who are in short supply, so when the skills shortage really bites, it will be you and I that will be commanding higher salaries. On the other hand, since our salaries (as April's EXE Salary Survey showed) are not, yet, taking off into dangerously dizzying heights, it is reasonable to conclude that a general skills shortage is, at the moment, just a twinkle in some headhunter's eye.

Of course, there are some skills that are in desperately short supply. Millennium bugfixing is an example. There was (and continues to be) a desperate shortage. The government ploughed money into training young people and re-training the unemployed – several tens of pounds of public money, if memory serves – specifically to fill the gap. All that effort availed nothing, of course, because anyone who was any good at millennium bugfixing was out fixing millennial bugs, and was far too busy to teach anything to anyone.

Actually, the reason for the skills shortage is obvious to anyone who tried to get involved in the hysterical flow of money once it had begun – the managers who were hiring knew nothing about the problems, and relied, as they always do, on proven experience. When faced with a professional of some twenty years of programming and debugging experience, with a dozen archaic languages and systems under his belt, they ask,

'Have you a proven track record of fixing millennium bugs?' The idiotically honest (people like me, for example) point out that, 'There hasn't actually *been* a millennium problem before, and since we've not yet hit D-day there's no possibility of any proven experience from anyone.' The idiotically managerial, deprived of their sole basis for judgement, are belligerently inconsolable; 'Shows what you know,' they bellow, 'I've got a whole roomful of highly paid experts who tell me different.' (You think I'm joking? Not a bit of it.) In point of fact, there is no shortage of decent bugfixers, and the salaries have stayed for some time at the kind of level that would attract the suitably talented to such soul-destroying work. The posts are going unfilled because there is a shortage of managers and recruiters who can tell the difference between a programmer and a used-car salesman. Retraining coal miners won't help that one iota. Retraining managers might, but they're all too busy interviewing.

In fact, the real IT skills shortage is sitting in plain view. There's even a picture of it, in the Salary Survey, at the very bottom of page 7 (Figure 12 – *Age range*). Nobody is saying anything, presumably out of some misguided sense of politeness, but that's not making the problem go away.

The problem is that programming just isn't sexy any more. Gone are the days when you could pull every bird at a party by saying, 'I'm a computer programmer' (or even, 'I'm a knowledge engineer'); now the

same utterance is as likely to get you ejected for being terminally uncool. How does the student of today select a career? If you're not smart enough to be a genetic engineer, not arty enough to do product design, and not hairy-chested enough to do business studies, you get to be a share trader or a civil engineer and console yourself with the unfeasibly large compensation package. But it's very unlikely you'll do programming – people don't seem to do programming any more. Computer Science degree courses are under-subscribed. Programming workshops paid for by job-creation schemes lie around, underused. It's not surprising, when you consider that the skills that were cutting-edge at the beginning of a three-year course are archaic and worthless by the end (and few courses even pretend to be cutting-edge at their outset). What's the point of learning mathematics and theory and even a decent coding style when the most useful skills of all are knowing how to find the sample code for the library classes in the online help, and knowing how to copy and paste it into the IDE. ('Design by photocopier' we used to call it in electronics, sneaking back to the copier to finish our designs only under cover of darkness.)

Programming is perceived to be a young person's game, but I suspect that's because comparatively few people have given up their career to become programmers – it's more likely for programmers whose brains are addled with age and C++ semantics to sidestep into some other field, such as management.

Since the peak in the early eighties, fewer people have been entering the programming profession every year. Now, the annual intake is smaller than it was in the seventies and is still falling, and consequently (if April's graph is correct) only 20% of us are under 30, and half of us are between 30 and 40. With the boom-time programmers becoming thirtysomethings (and older), I reckon people will think of us as youngsters less and less. In fact, since we're all getting older and there's so little new blood coming in, soon most of us will be over forty, and many of us will be grandparents, and the myth of programming being for kids will be laid to rest for good.

This situation will be fine for those of us who stay in the business, because natural attrition being what it is, the dwindling number of survivors will be able to command more and more money long into their supposed retirement. But I'm also a bit worried by the thought. Programs have to come from somewhere, there's plenty more programs to be written, and someone has got to write them. If programming continues to be unattractive, there will be slightly fewer programmers every year, until, suddenly, all those boom-timers will drop out of the workforce, and there will be an abrupt shortage of programmers. Skills won't be the issue then; there simply won't be enough bodies to go around. This will create the same kind of mess as today's Y2K problem, but industry-wide and worldwide. By then, we'll all be so busy writing programs that we won't have time to teach what we know to a grudging next generation. ■

*Jules is still programming, and is counting the days until he is, once again, invited to the kind of parties that he wants to go to. If you are planning an event, you can call him on 01707 662698, or email him at [mayhem@jules.cix.co.uk](mailto:mayhem@jules.cix.co.uk).*







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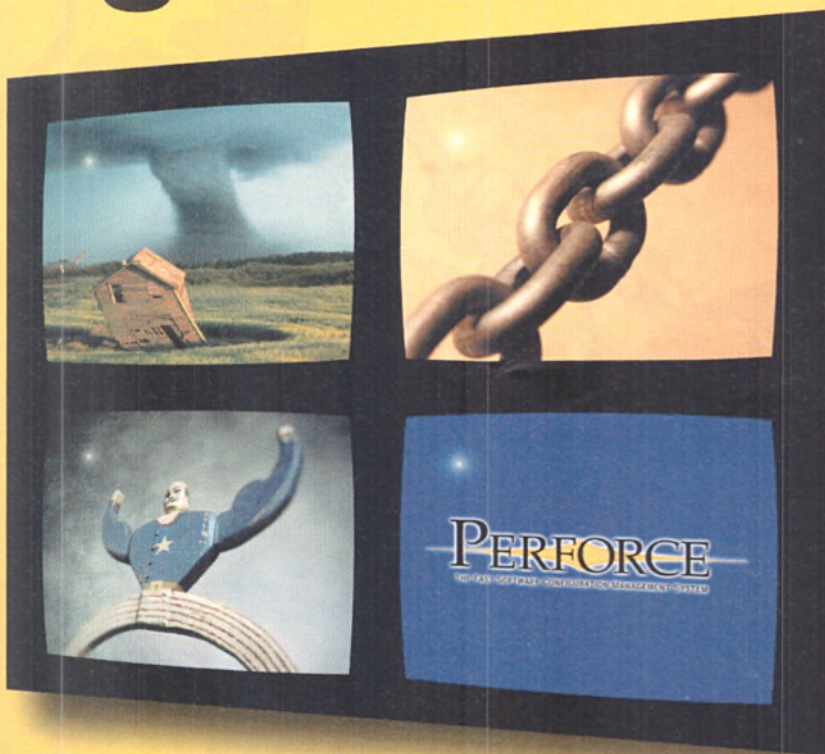
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## Delphi is on the up

Dear Sir,  
Your salary survey this year was interesting and well-designed, and we were pleased to have the opportunity to participate in it. Thank you, too, for sending out your April issue containing the results to our members. There is just one part of your analysis of the results that I question, however. You say, 'One surprise is the apparent decrease of interest in Delphi (a 6% drop from last year).' May I suggest that this does, indeed, only appear to be so because fewer of our members responded to the survey? Yes, I do realise that not all your Delphi readers are UK-BUG members (yet!), but I did rather spoil your chances by attempting to run a similar (and, I now confess, rather poorly conceived) survey within the group a short while before.

If our membership is anything to go by – and we believe that it is – Delphi has increased in popularity during the last year. We are happy to report a steady stream of developers joining the group (which currently stands at around 1800 people), whereas our non-renewal rate remains very low. Members' obvious enthusiasm for Delphi and related technologies is infectious, and is prompting other developers to investigate it for themselves. You can, of course, only analyse the results of what comes in, rather than to guess at the whole picture. We do, however, believe that the drop you report doesn't actually exist.

Keep up the good work.  
*Joanna Pooley*  
Director UK Inprise/Borland  
User Group (UK-BUG)  
[bug@richplum.co.uk](mailto:bug@richplum.co.uk)

Thank you for your kind words. I'm afraid a drop certainly did occur as this year we received a few more questionnaires filled-in by UK-BUG members (34 compared to 21 last year – for which, many thanks). However, this increase is too small to be statistically valid. The survey takes a snapshot at one precise point in time while membership runs through the whole year. At the time the questionnaires went out Inprise showed all the symptoms of being in turmoil. Now that the Borland name is back and the strategy regarding the Borland products line is clearer, some developers are probably reassured.

Although C and C++ are the languages most used by the survey's respondents, slightly less than a third are ACCU members. It seems that relatively few developers join associations. Is it due to lack of free-time? Or lack of interest? Or maybe general apathy? Associations can influence the industry and should play an important role. Their strength is directly dependent on membership, so the strength of root participation is an issue.

If you have strong reasons for not joining the user associations/groups relevant to your development activity

please email or write to us. I'd be interested to figure out how developer associations can get stronger.  
*The Editor*

## Monopoly

Dear Sir,  
Of course Microsoft is a monopoly (*Mayhem*, EXE, April 1999 and *Letters*, May, 1999).

91% of the desktop is a monopoly in anyone's language or grasp of arithmetic. However, monopolies are not illegal in the UK or USA, nor in many other countries. What is illegal in most countries is the abuse of a monopoly position. Any reasonable person can understand why governments should want to regulate markets in such a way as to create/preserve genuine customer choice. The tricky bit is the corporate surgery and sanctions implemented to bring about the required result.

It is fairly clear that the email evidence alone against Microsoft in the three major US trials (Caldera, Sun, and the DOJ) is very damning. Microsoft will be found guilty.

Scott McNealy of Sun has suggested that Microsoft must not be allowed to purchase companies or technologies – so it could only grow organically. The Microsoft expert, Graham Lea, has suggested that the courts should declare Windows to be an 'essential facility', ie like a public (non-proprietary) footpath that anyone can use. I think that the enactment of both these measures will bring about the right result.

A final point is that the trials of Microsoft are not solely about Microsoft itself. They are about preventing any IT vendor from ever again attaining such an overwhelming monopoly position and the inevitable abuse of that position.

*Eric Leach*  
Managing Director, ELM Ltd  
[eric\\_leach@compuserve.com](mailto:eric_leach@compuserve.com)

## Is it AD or BC?

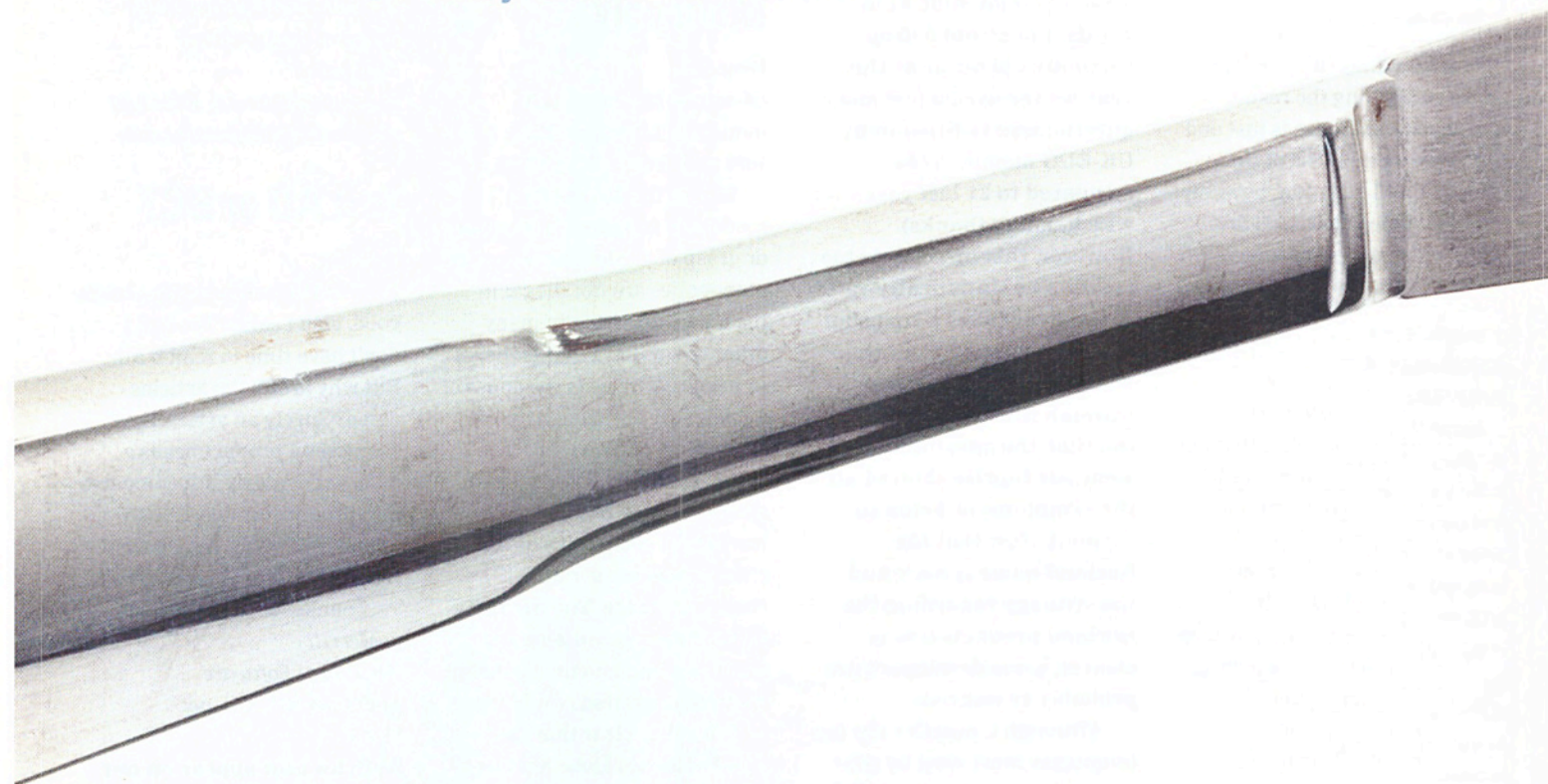
Dear Sir,  
I've visited your website – looks good, glad I came. Too bad I don't have time to read it all. But why aren't the articles dated? Surely an article that discusses a product needs a date, particularly if it compares that product (or doesn't!) to others that might have been released later.

Thanks for listening.  
*J. Merrill*  
Analytical Software  
[jamesmerrill@usa.net](mailto:jamesmerrill@usa.net)

Articles that appear on our website (we have a complete archive going back to July 1997 up at the present time) are indexed by date. When you look at the listings page for the archive, it shows the year and month for each group of articles. That said, the date does not explicitly appear on the document itself. It's actually a simple matter to make this happen, and since you asked so nicely, I've done just that. You'll now find the date of an article at the top and bottom of the page.  
*Neil Hewitt*



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So Why Make It More Difficult?**







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Doing two things at once is one of those things that, once learnt, seem easy. But we forget how hard it was the first time. What has this got to do with software development? Well, I have a friend writing a program in Java. It is a numerical simulation of a star cluster that allows the user to setup, display, or edit the positions and motions of the stars. Over a few pints of beer one evening, he started telling me about the difficulties he was having trying to incorporate an 'undo' facility into his user interface. This was necessary to deal effectively with mistakes made when entering changes. The Java 'Swing' library contains frameworks both for the user interface components and for managing an undo facility.

My friend knew what he wanted to achieve, but was having difficulty accomplishing it. He felt that he needed to write a class that implemented the interfaces required by both frameworks, but he also wanted to take advantage of the default implementations that each framework provided. Whichever approach he tried it got messy and he felt that there really ought to be a 'neat' solution.

In fact, the approach he was trying to follow is the one I would have automatically adopted in C++, ie to use multiple inheritance to derive a class from both default implementations. My friend was in difficulties because this sort of multiple inheritance isn't allowed in Java.

### Defining frameworks

Let's have a definition. An *Application Framework* provides both the design architecture and a generic implementation of some general-purpose subsystem, in the form of a library of interacting classes. For instance, a GUI represented by window classes, button classes, and so on. To make use of the framework within an application the developer modifies the state of some class instances (adding button instances to a window instance, for example) and specialises the behaviour of some classes (perhaps in order to provide a meaningful response to a button push).

A well-designed framework makes the task of the developer simpler because it takes care of all the routine tasks, such as managing the relationship between the buttons and the window. This leaves the developer free to spend time on the important ones, ie what to do when the button is pressed.

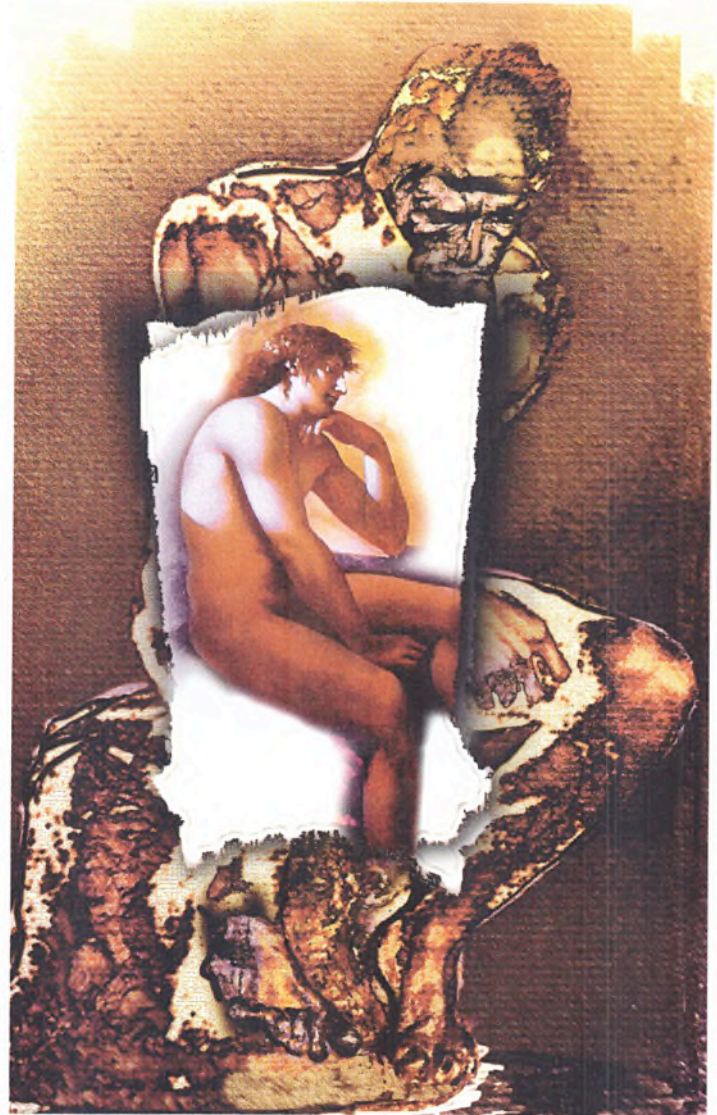
Even when there is no 'off the shelf' framework to support a subsystem it is worth considering developing a framework to support it. The effect of this is to separate out the generic functionality from the specifics of the software's current version. This allows future changes to be accommodated without modifying the framework, and with only minor changes to existing code. The payoff comes when developing the next version – time is spent creating new code that is dedicated to the new features of the program, not trying to figure out why something that used to work is now 'broken'.

You will have realised by now that I am enthusiastic about frameworks, so you won't be surprised to read that I frequently use several within an application. This can lead to some interesting design challenges focused around the objects that interact with more than one framework.

### An example of two frameworks

To avoid going into the detail of my friend's 'real world' problem I've devised an example that contains the essence of the problem and which can be expressed in both Java and C++. This will form the basis for the rest of the article and allows an examination of the different solutions supported by these languages.

For current purposes it doesn't really matter what the application is, or what it looks like. For the following example to work we need



Patricia Deardorff

assume only that there is a display we can add to and a process that takes a long time and reports its status via some form of 'status monitor'. I often work with programs that analyse large volumes of data, but it could equally well be a chess program considering its next move.

In developing this program we will be using two frameworks. The first framework delivers the user interface, and the second provides the processing done by the application.

While the processing is being done the modern user will expect a progress bar and a cancel button, or perhaps a 'move now' button for the chess application. This means that in writing a program we need to add a visible component to the display that shows the processing status. To achieve this we require a class that implements both user interface behaviour (displaying itself) and processing domain behaviour (receiving progress notification messages).

The following classes make up the relevant parts of the display framework:

**DisplayInterface**

This defines the protocol used by the display framework to present an object on the screen.

**DefaultDisplay**

Provides a default, 'do nothing', implementation of the interface.

**Display**

The part of the UI that we wish to use to display the status.



# When frameworks meet

Combining elements of different application frameworks can present difficulties. Alan Griffiths translates a C++ idiom into Java, a Java idiom into C++, and muses on the nature of translation.

The following classes make up the relevant parts of the processing framework:

**StatusMonitorInterface**

This defines the protocol used to report the current status.

**DefaultStatusMonitor**

Provides a default, 'do nothing', implementation of the process framework status monitor interface.

**Processor**

The part of the processing framework that supplies the progress notification messages.

Listings 1 and 2 provide corresponding code in C++ and Java respectively. So far the differences between the languages are minor and relate only to their syntax.

Before going any further and presenting the rest of the code, I'd like to make two points. First, in the general case, framework interfaces will have a number of methods, but for the sake of brevity I show only a couple. Second, in presenting these approaches in both languages I've adopted a coding style that emphasises the similarities of design but is not idiomatic in either language (eg it is unusual to implement C++ methods in the class body).

## A worked example using multiple inheritance

One of the better uses for multiple inheritance is to add *mixins* to a class hierarchy in addition to the usual taxonomic ('is a') relation-

ships. A mixin is a class that defines the protocol required for an operation, such as displaying. To derive from a mixin class declares that the protocol is supported (ie that the derived class may be displayed) not that the derived class is of a type represented by the mixin (ie it is not 'a displayable'). For effective use, mixins require multiple inheritance. For my example, a progress display is a status monitor *and* it can be displayed.

In C++ default implementations for mixins can be used directly. As can be seen from Listing 3, if the default behaviour is all that is required then there is almost nothing to it.

I've been designing and implementing systems in C++ for over a decade, so I tend to adopt design solutions that I know work well in C++. Of course, these designs are not specific to C++. It would be surprising if a design stopped working just because it is expressed in a different language!

I've only been dabbling with Java for a little over two years, but I've found that most of the designs I come up with work. There are some pitfalls to avoid since C++ supports paradigms that Java does not, eg 'generic programming', but this doesn't fall into such a category. The immediate question is: 'How can this design be expressed in Java?'

Translating Listing 3 into Java is complicated by the need to combine two default implementations. We cannot copy the C++ approach directly and use direct inheritance since the rules governing inheritance in Java mandate that we inherit from at most one of them. This arises because Java distinguishes interfaces from other classes, and while a derived class may inherit from multiple interfaces it may

```
// User interface
class DrawingSurface;    // No definition needed
                        // for this article
class DisplayInterface {
public:
    virtual void drawOn(DrawingSurface& surface) const = 0;
    virtual ~DisplayInterface() {}
};

class DefaultDisplay : public DisplayInterface {
public:
    virtual void drawOn(DrawingSurface&) const {}
};

class Display {
public:
    void add(DisplayInterface*);
};

// Processing
class StatusMonitorInterface {
public:
    virtual void setPercentComplete(double percentage) = 0;
    virtual bool isCancelled() = 0;
protected:
    ~StatusMonitorInterface() {}
};

class DefaultStatusMonitor :
    public StatusMonitorInterface {
public:
    virtual void setPercentComplete(double) {}
    virtual bool isCancelled() {return false;}
};

class Processor {
public:
    void doLongCalculation(
        StatusMonitorInterface& status);
};
```

Listing 1 – Framework classes in C++.



```
// User interface
public interface DisplayInterface {
    public DisplayInterface
        drawOn(java.awt.Graphics surface);
}

public class DefaultDisplay
    implements DisplayInterface {
    public DisplayInterface
        drawOn(java.awt.Graphics surface) {
        return this;
    }
}

public class Display {
    public void add(DisplayInterface d) {
        // . . .
    }
}

// Processing
public interface StatusMonitorInterface {

    public void setPercentComplete(double percentage) ;
    public boolean isCancelled();
}

public class DefaultStatusMonitor
    implements StatusMonitorInterface {

    public void setPercentComplete(double percentage) {
    }

    public boolean isCancelled() {
        return true;
    }
}

public class Processor {
    public void doLongCalculation(
        StatusMonitorInterface status) {
        // . . .
    }
}
```

Listing 2 – Framework classes in Java.

```
class ProgressDisplay :
    public DefaultStatusMonitor,
    public DefaultDisplay {
};
```

Listing 3 – Using multiple inheritance in C++.

```
public class DefaultProgressDisplay
    implements DisplayInterface, StatusMonitorInterface {

    public DisplayInterface
        drawOn(java.awt.Graphics surface) {
        d.drawOn(surface);
        return this;
    }

    public void setPercentComplete(double percentage) {
        p.setPercentComplete(percentage);
    }

    public boolean isCancelled() {
        return p.isCancelled();
    }

    final private DisplayInterface d =
        new DefaultDisplay();
    final private StatusMonitorInterface p =
        new DefaultStatusMonitor();
}

public class ProgressDisplay
    extends DefaultProgressDisplay {
};
```

Listing 4 – Using multiple inheritance in Java.

inherit from only a single non-interface class. A default implementation must be a non-interface class because, in Java, an interface has no implementation.

An ancient programming maxim is that 'all problems are solved using an extra layer of indirection' and this applies to the current case. Listing 4 introduces an extra class `DefaultProgressDisplay` whose sole purpose is to delegate the default behaviour for both interfaces while still allowing derived classes to override those that are of interest.

This was the method I showed my friend. It accomplished what he was already trying to do and was a straightforward translation of the design idiom I'd use in C++. At the time, we were both happy with it. Subsequently, I became dissatisfied with using this approach in Java.

First, it occurred to me that it may occasionally be impossible to apply, when method collisions arise (I'll take this point up again in a moment). Second, and more seriously, there is a potential 'gotcha': it is possible for one default method implementation to be defined in terms of another – the approach shown doesn't work when only the latter method is overridden.

Upon examining other Java code I'd written, I realised that in analogous situations I was invariably using a different approach. And this alternative approach avoids both of the problems. But before looking at it, let's just consider what happens if both interfaces have a method with the same signature.

### Dealing with collisions

To see why this is a problem, suppose that both interfaces declare the following method:

```
void methodThatCollides()
```

If we add this method to the `ProgressDisplay` class, then it could be invoked through either interface. What code do we put in the body? For `StatusMonitorInterface` we need to write one thing and for `DisplayInterface` we need to write another – we can't get it right!

In C++ this issue can be resolved by adding a pair of intermediate classes into the hierarchy that effectively rename the message so that we can determine its origin. Listing 5 shows the way. This is a perfectly general solution although there is a slight danger that a maintenance programmer will break this one day by innocently overriding `methodThatCollides`. It would be nice to use a Java feature and declare that method `final` (which generates a compilation error if overriding is attempted) but there is no corresponding option in C++.

In Java, this technique cannot be applied as it relies on the fuller support for multiple inheritance present in C++. But as I have already indicated this is not a problem because there is a better approach...

### A worked example using adapters

The alternative I discovered was based on the observation that Java's 'anonymous local classes' provide a very elegant and natural solution based on the adapter pattern, described by the 'Gang of Four' (*Design Patterns*, ISBN 0-201-73371-2).

In the adapter pattern an adapter class is used to translate between the interface required by some function (eg printing) into that supplied by a class that doesn't implement that interface directly but does do something sufficiently similar (eg provision of display text). An adapter accepts messages from the function and converts them to corresponding ones understood by the target class.

There are a number of reasons for using adapters outlined by the Gang of Four, but the one that concerns us here is that it may be impractical to subclass the interfaces required by both frameworks.





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Listing 6 shows an implementation using this approach. The `ProgressDisplay` class implements functionality corresponding to the methods we wish to adapt and there are two fragments of 'client code' that create suitable adapters for the two frameworks.

Programmers unfamiliar with Java 1.1 language features may find the syntax used in Listing 6 a little mysterious. Briefly, there is an implicit class definition within the `new` expressions: this class derives from the default class named, has no name itself (the compiler generates one), and has the members that occur between the braces. This lightweight syntax for declaring local classes and simultaneously creating instances of them is a great convenience.

The use of adapters frees the `ProgressDisplay` class from the need to implement the interfaces required by either framework directly. And an adapter for one framework doesn't need to implement any of the functionality required by the other, so the restrictions on multiple inheritance in Java are not an issue that affects this idiom.

When using adapters in C++ we still have a significant design decision to make: something needs to own the adapter objects and control their lifetimes. The programmer is responsible for ensuring that object instances are deleted when they are no longer in use. (In Java, the 'virtual machine' will reclaim the objects that are no longer in use.)

In order to translate this design idiom into C++ I needed to address this point and, for simplicity, I've chosen to embed the adapters as nested classes within the `ProgressDisplay` class. See Listing 7. This avoids any complex logic to manage them by ensuring that they will be created and deleted with each `ProgressDisplay`. They do not have to be embedded like this, but I'd have to introduce additional classes and assumptions to avoid it.

There is something appealing about Listing 7, but I feel quite strongly that it is 'clever' rather than 'good' code. It should not normally occur to a C++ programmer to do things this way. The implementation of the `ProgressDisplay` class is now intimately entwined with the two adapter classes. This is more easily achieved using the mixin approach shown in Listing 3.

```
public class ProgressDisplay {

    public void myDrawOn(java.awt.Graphics surface) {
    }

    public void setPercentComplete(double percentage) {
    }

}

public class ClientCode {

    void addToDisplay(
        Display d,
        final ProgressDisplay progDisp) {

        d.add(new DefaultDisplay() {
            public DisplayInterface drawOn(
                java.awt.Graphics surface) {
                progDisp.myDrawOn(surface);
                return this;
            }
        });
    }

    void doLongCalculation(
        Processor p,
        final ProgressDisplay progDisp) {

        p.doLongCalculation(new
            DefaultStatusMonitor() {
                public void setPercentComplete(
                    double percentage) {
                    progDisp.setPercentComplete(percentage);
                }
            });
    }
}
```

Listing 6 – Using adapters in Java.

#### Transformation with translation

Effectively, we have been looking at two different formulations of a single idea – an object that can interact with both the display and the processor. What is surprising is that the choice of implementation language has such a dramatic effect on the ease with which each approach can be expressed. It could be argued that the correct translation of Listing 3 (using multiple inheritance in C++) is not Listing 4 (which is not idiomatic Java), but Listing 6 (which is).

The idea that an adapter is the correct translation of a mixin seems strange at first. But Kevlin Henney has previously observed a similar relationship between 'iteration' and 'enumeration' when moving between languages (in *Idioms – breaking the language barrier* at the 1998 European C and C++ Users Conference). This change of form as a result of translation isn't just a characteristic of computer languages – Douglas Hofstadter dedicates a substantial volume to similar interactions between the ideas being expressed and the forms of expression in different natural languages (*Le Ton beau de Marot*, ISBN 0-5456-3345-0).

Why does changing the implementation language change the way in which the problem is solved? Well, the mixin approach works well in C++ because it removes the problem of object lifetimes that occurs in the adapter approach. In addition, the more flexible C++ inheritance model allows default behaviours to be combined and the occasional problem of methods clashing to be resolved. The adapter approach works well in Java both because of the lightweight syntax for declaring anonymous local classes and because the JVM, not the programmer, has responsibility for controlling object lifetimes.

Mixins and adapters are both idioms I've used before, but I had not previously considered the possibility of a relationship between them. I see now that they are very close and solve related problems. The choice between them may depend on the fine detail of the problem at hand.

```
class IntermediateDisplay :
    public DefaultDisplay {
public:
    // DO NOT OVERRIDE methodThatCollides()
    // - override displayMethod() instead
    virtual void methodThatCollides() {
        displayMethod();
    }
    virtual void displayMethod() {
        DefaultDisplay::methodThatCollides();
    }
};

class IntermediateProgress :
    public DefaultStatusMonitor {
public:
    // DO NOT OVERRIDE methodThatCollides()
    // - override progressMethod() instead
    virtual void methodThatCollides() {
        progressMethod();
    }
    virtual void progressMethod() {
        DefaultStatusMonitor::methodThatCollides();
    }
};

class ProgressDisplay :
    public IntermediateProgress,
    public IntermediateDisplay {

    virtual void displayMethod() {}
    virtual void progressMethod() {}
};
```

Listing 5 – Dealing with signature clashes in C++.



```

class ProgressDisplay {
public:

    ProgressDisplay() :
        pia(*this), uia(*this) {
    }

    void myProgressStatus(double) {
    }

    void myDrawOn(DrawingSurface&) const {
    }

    operator StatusMonitorInterface&() {
        return pia;
    }

    operator DisplayInterface&() {
        return uia;
    }

private:

    class StatusMonitorAdapter :
        public DefaultStatusMonitor {
    public:

        StatusMonitorAdapter(ProgressDisplay& adaptee) :
            body(adaptee) {
        }

        void setPercentComplete(double percentage) {
            body.myProgressStatus(percentage);
        }

    private:

        ProgressDisplay& body;
        StatusMonitorAdapter(const StatusMonitorAdapter&);
        StatusMonitorAdapter&
            operator=(const StatusMonitorAdapter&);
    } pia;

    class DisplayAdapter : public DefaultDisplay {
    public:

        DisplayAdapter(ProgressDisplay& adaptee) :
            body(adaptee) {
        }

        void drawOn(DrawingSurface& s) const {
            body.myDrawOn(s);
        }

    private:

        ProgressDisplay& body;
        DisplayAdapter(const DisplayAdapter&);
        DisplayAdapter&
            operator=(const DisplayAdapter&);
    } uia;

    ProgressDisplay(const ProgressDisplay&);
    ProgressDisplay&
        operator=(const ProgressDisplay&);
};

```

Listing 7 – Using adapters in C++.

For those who wish to draw conclusions about the superiority of one language or the other I've shown that both choices are always available in C++, while the mixin approach may sometimes be problematic in Java. On the other hand, the adapter approach is more flexible and much simpler to implement in Java. ■

*Alan Griffiths works at doing OO design and writing C++ and plays at writing Java. He has a website at <http://www.octopull.demon.co.uk> and can be reached by email at [alan@octopull.demon.co.uk](mailto:alan@octopull.demon.co.uk).*

*This article is based on the author's 'Fitting in with multiple frameworks in C++ and Java', which appeared in the April 1999 issue of Overload (the magazine of the ACCU C++ SIG).*



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**R**AD tools come and go with frightening frequency, or so it may seem. In fact, while there is a fairly constant stream of new products appearing on the market, very few of the existing tools completely disappear. What often happens is that they appear in a blaze of glory, attract the attention of a number of programmers, and then fail to gain critical mass to become another Delphi or Visual Basic. But what happens to the developers who have already started to build applications in these products? Well, some move on to the next latest and greatest product, but a number often stay with the product because they really do see a benefit in the features that first attracted them.

Into this category falls TopSpeed's Clarion, which appeared with a lot of noise some years ago and then slipped back into the twilight zone of RAD tools. Despite this, the product is on the move again. Last year I attended its developer conference at Gatwick Airport and discovered that many of the developers who were there to see what was happening are fiercely loyal to the product. Yet it was, at that time, still a long way behind many of its competitors in the RAD market. There was much talk about new features and many of the developers at TopSpeed seemed to be obsessive watchers of *Star Trek*: the word 'Borg' was being used with remarkable regularity, but now the product has finally shipped this particular feature has been renamed to Wizatron. (A warning here. In the initial release of Clarion 5 everything was called wizards, but with service releases 5a and 5b they have all been renamed Wizatrons. Unfortunately, the patches do not update all of the documentation or menu items, so it can get a little confusing when working through the product.) The main goal of the conference was to map the way ahead for those loyal developers who had persisted with the product and to herald some interesting new technology that was due for delivery in Clarion 5. That product duly arrived through my door and I decided to take a look at what it offered and how easy it was to get started. Both of these points are extremely important if TopSpeed is to retain and even attract new developers.

Unlike many tools today, Clarion 5 arrived with a full set of paper documentation that is relatively clear, concise, and easy to use. Unfortunately, while the Clarion developers are based in the UK, the documentation team is based in the US and the result is that no effort has been made towards internationalisation. It takes less effort than many vendors think to localise their documentation and the result makes people feel more comfortable with the product. While online help appears to be the preferred method of delivering information today, I'm a little old fashioned and find that paper documentation is easier to update and make comments in, particularly when you have a problem with a function. The ability just to write a little example of your own in the margin pays dividends over a period of time, especially in the early learning stage. However, the documentation for the Wizatrons was not available in paper form and you need to download it, plus a patch for the language reference, from TopSpeed's website ([www.topspeed.com](http://www.topspeed.com)).

Throughout the documentation, and when you speak to TopSpeed and its developers, everyone wants to be sure that you understand that Clarion 5 is an OO-based RAD tool. Yet unlike its primary competitors such as PowerBuilder or Centura it lacks a proper tutorial to explain what OO involves. There are no tutorials, explanations of best practice, or warnings against worst practices when it comes to developing and designing class libraries. This is an area where many developers have problems with their tools and each vendor will have a different focus on best practice as it affects their product.

#### Early warning

Installation was extremely simple – just point and click – although the installation utility, like many others today, needs a little finishing off.



John Holcroft

I find it quite irritating when a program asks to reboot the computer and then fails because it cannot shut down its own installation routine. A minor point I know, but one that a number of tools suffer from and which often indicates that there are other, more important areas of code that haven't been finished properly. One thing to remember, particularly if you intend to install the product on a portable machine for use when travelling, is that you are not asked for the product key until you start Clarion for the first time.

The Enterprise edition comes with a number of additional tools that can be installed to enhance the features contained within Clarion. Among these is the TopSpeed Version Control System, which is an embedded version of PVCS. If you are used to holding all the information on a single computer, or to using Clarion while on the road, this feature does not work well as most of the functionality is disabled when it is not installed on a network drive. Leaving that aside, the version control works well within the product and such integration has obviously been seen as an important feature for team working. With PVCS at the back-end you have access to all the power of the leading SCM tool in the market, and TopSpeed is currently working on allowing you to use your preferred SCM tool, such as StarTeam or ClearCase.

The full online manuals are easily installed and take up as little as 30 MB of space, much smaller than many of the other RAD tools today and TopSpeed includes a copy of Adobe Acrobat v3.01 on the CD. You can install either the Pervasive SQL Engine on a network drive or the Btrieve workstation engine on your local machine. And there are many third-party utilities included on the CD that can be installed for a trial period. At its developer conference, TopSpeed was talking up the part that these developers were playing in helping make Clarion appeal to a wider audience by providing a richer toolset than the product has had for some time.



# Clarion 5 – the attack of the Wizatrons

**Ian Murphy reviews Clarion 5, the OO RAD tool that inspires a fiercely loyal following.**

The last item on the installation CD is the Wise installation utility. Wise Solutions has been taking a large part of the installation market over the last year, but the version shipped with Clarion does not include any Microsoft Installer (MSI) technology. Both Wise and TopSpeed were asked when an upgrade would become available and neither was prepared to comment. With use of the MSI key to gaining Microsoft Windows 2000 logo programme status, and with Microsoft already using the technology itself with the Office 2000 release, it is important that developers get early access during the development phase of their applications.

To complete the installation you will need to visit [www.top-speed.com/c533-upd.htm](http://www.top-speed.com/c533-upd.htm) to download the current set of updates and patches. All in all this takes around 6 MB and some of the figures of file sizes on the website are misleading. You will need to read the site information carefully to ensure that you download only those files that you actually need.

## Enter the Wizatrons

Clarion is driven by the use of Wizatrons, and while this was being pushed at the developer conference at Gatwick it was not until I started to work with the product that it became clear just how far TopSpeed felt the Wizatrons should go. This type of approach works well in many other RAD environments, particularly when you need to create systems while working with user departments and design teams. Unfortunately, it often introduces a false perception of what is involved in developing a serious business application and the resultant systems tend to perform poorly when they are used to manipulate large amounts of data. Another failure of many of these systems is that they either ignore the problems of the database completely or they surround the database with a very lim-

ited development language. TopSpeed appears to have recognised these problems, and has made a good attempt at avoiding this sort of criticism.

Before you start with Clarion you will need to make a decision on the platform you are developing for. This is more critical than you might think because by default Clarion 5 will assume that you are developing for 16-bit applications. This can result in unexpected problems in attaching to your database, particularly if you are using an ODBC connection. In its out of the box default setting Clarion expects to find the ODBC.DLL, the old 16-bit driver. When using Windows 9x or NT, it is unlikely that you will have this 16-bit file available and instead you will have ODBC32.DLL. While you can take the step of changing the setup for each project that you create, the simplest solution is to update the CLARION5\BIN\C5EE.INI file. Ensure that you do not have Clarion 5 running, then open the INI file with a text editor. Go to the [Project System] section and set `default32bit=on`. Failure to do this will almost certainly result in your spending a lot of time wondering why you cannot access your local database.

To create an application with Clarion you begin with the Application Wizardron. The first time you use the Quick Start Wizardron it will prompt you for the name of the primary data file and give you an option as to the file format in which you want to save this file. The range of file formats is quite extensive and covers the bulk of the desktop databases, adding Pervasive.SQL and Microsoft SQL. It doesn't have a direct driver for MS Access and this was very strange. In addition, if you want to use Oracle, Informix, DB2, or any other corporate database, you will have to check if there is a direct driver available or rely on an ODBC connection.

Once you have setup your primary table, or pointed Clarion at an existing data source, your initial application is generated for you. This uses some simple templates to create a browse and update form for the primary table along with some default reports. The number of indexes controls the number of reports that are generated. This initial code is then organised into basic modules and you are in a position to either continue with the Wizatrons or insert your own code.

Note that there is no need to proceed any further than this with the Wizatrons. However, TopSpeed has done a good job of providing Wizatrons that will move you much further towards your overall goal before you start writing code. In fact, you can compile the code straight from here and run the application if you so choose. Clarion actually creates a true executable that you can run via Explorer or the command line, rather than an interpreted code version that needs the development environment.

Once you have created your initial application via the Wizardron, you will almost certainly want to ensure that the application is aware of the structure of your database. This is done via the data dictionary and the simplest way is to invoke the data dictionary through the File, Open menu. This allows you to create tables as necessary and then to build the relationships between those tables. A warning: if you are doing this straight after building your initial application, you must remember to close the application before attempting to add new tables through this method. If you don't, then you will find that the Quick Load Wizardron, which allows you to add additional tables doesn't seem to initialise. This was extremely irritating because there was no error message and there was nothing in the online support database. The only place in the manual where I was able to track down any reference to this was in the Quick Start guide at the bottom of page 20, and this after talking through the problem with TopSpeed technical support in the US. The code has to be returning



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some sort of flag to say the data dictionary is locked, so it doesn't take much to trap the call and put up either an error message or a warning to the user. This should have come out in testing, not been left to users to stumble across.

There are several issues surrounding the actual database itself. TopSpeed does not create the database, it only creates tables from the data dictionary, so you need to ensure that you have already created the database into which the tables are to be inserted. In addition, you will need to ensure that you synchronise the data dictionary with the database if you want your tables to be saved. Otherwise, they are held by the data dictionary and not written away, even though they still appear to you when you are using the system. This is extremely disconcerting because you can insert and modify data and when you then run an SQL query against your database it is empty.

### The Data Modeller

The best way of actually starting an application with Clarion 5 is to avoid the Quick Start Wizatron to begin with and use the Data Modeller, which TopSpeed has licensed from Pea Brain Software. While I accept that I have a soft spot for data modelling tools, and in a later issue I intend to take a look at several database modelling products, this tool is extremely well thought out and comprehensive. There is little doubt that it has been designed from a DBA perspective because it contains a host of options that simplify database construction. See Figure 1.

Each table has a number of settings, including the ability to require data encryption, reclaiming of deleted record space, and the option of declaring that you are only going to use the 32-bit version of the database engine. The options for fields are even more impressive with validity checking, attribute control, window type, and help text including tool tip options being just some of the choices. Indexes are catered for in similar detail and, when they are used in a relationship, the Relationship Editor is straightforward and relatively easy to use. I say relatively here because there appears to be an assumption that any relationship will be created from complex keys and you have to take a couple of unnecessary steps when using a simple index. These steps could easily be eliminated by a simple check of the field that is used within the index.

Another option inside the Data Modeller is the ability to output a SQL script file for generating the database, and you can choose to create files, indexes, and keys along with rules and any relevant triggers. The resultant SQL output file can then be edited manually to make any

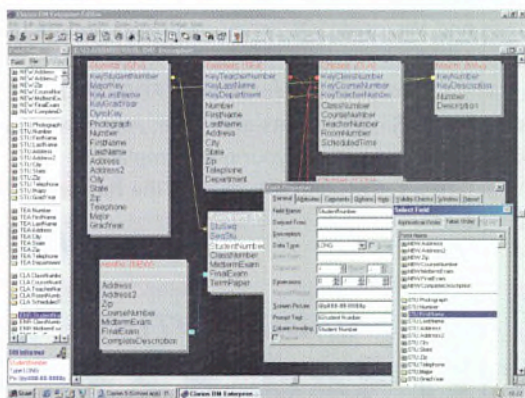


Figure 1 – The Data Modeller in action.

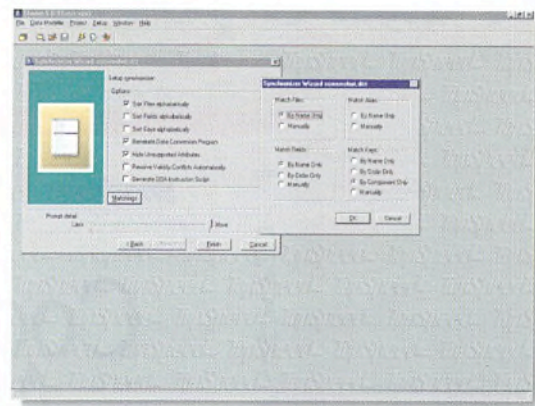


Figure 2 – The Synchronisation Wizatron with a customisable level of complexity.

changes you might want. And there are some extremely useful tools. For example, providing the ability to calculate the size of a database over a period of time based on the expected number of records per month. And you can create test data extremely quickly – this is a feature that few RDBMS contain and even fewer design tools provide. Conversion-program creators and applets to manage the sequence of unloading are also provided. The latter is extremely important if you are planning to move data from one database to another and you do not want to breach any referential integrity rules that you have created.

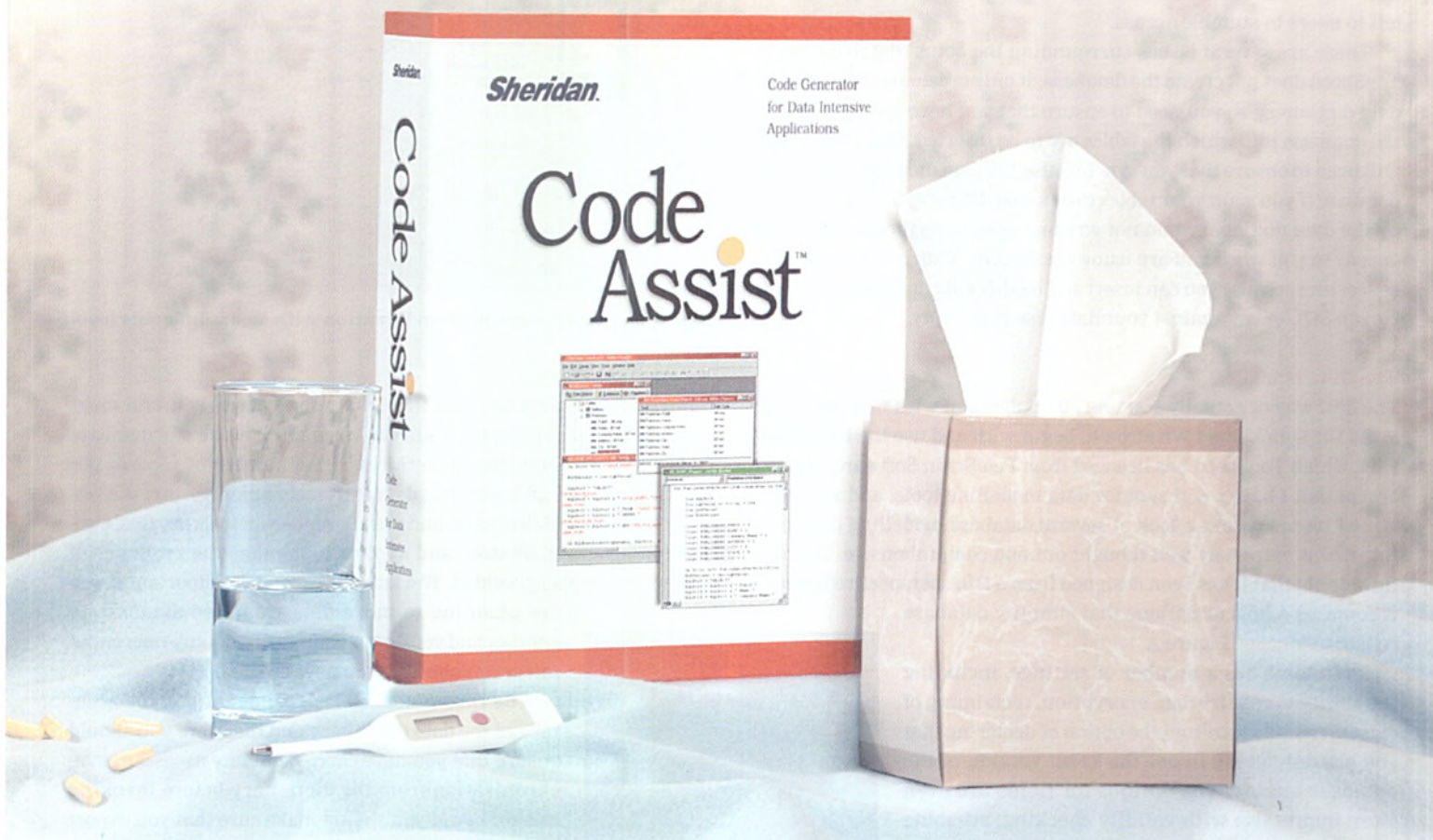
The Data Modeller is dependent upon the accuracy of the data dictionary and therefore you should ensure that you have carried out any necessary synchronisation from the dictionary before invoking this tool. And you should make sure that you export back to the current data dictionary upon completion. The synchronisation utility can also be invoked from the Data Modeller and this adds some extremely powerful functionality. The first time you use the Synchronisation Wizatron from the data dictionary you will notice that it has a slide bar. This allows you to decide just how much complexity you want to see when working with the screens created by the Wizatron. As a result, experienced users can choose to be faced by a large number of different choices and those who are less adventurous can have the Wizatron fill in the missing bits behind the scenes. See Figure 2.

One of the more powerful choices when working through this process is to have the Wizatron synchronise in both directions during the same execution. If there are several people working on different parts of the database using a range of tools, you can update your work from inside Clarion 5 while updating your data dictionary with their additions. The result is that you can work on large projects with the minimum of disruption for project managers and DBAs. The tool can also resolve validity conflicts itself and will produce a DBA instruction script that tells you when there are a number of problems that you have to take specific action on. Typically, this will be used only when migrating your database from one product to another, and this is where the synchroniser can be at its most effective. By checking data types and creating the relevant scripts, it allows you to prepare the way for a massive data translation while minimising DBA input.

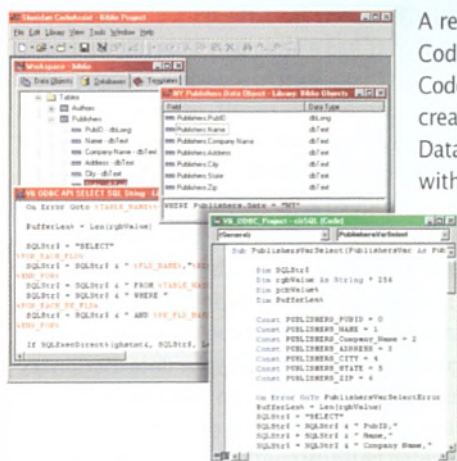
Once you reach the actual mapping page, you simply need to tell the Wizatron which way to do the synchronisation and whether to add or merge into the existing structure. Remember, at this point you



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must have already created the empty database and this will need to be done through the tools that ship with your RDBMS. If there are any problems at this stage, such as a field mismatch, then the Wizatron will not allow you to click on OK and will use a series of Stop symbols to prevent you from going further until you correct the problem.

### The Application Wizatron

Once you have designed the database using the Data Modeller, the next stage is to invoke the Application Wizatron, rather than the Quick Start Wizatron, to build your application. If you have an existing database, then you will want to use the Application Wizatron anyway. This Wizatron gives you much more control over your design and file selection process, allowing you to choose the dictionary file, a help file, and which initial template you want to use for the application. This has the major advantage of allowing you to build corporate templates for different classes of applications and to use them to enforce style and programming rules. With many corporate development teams working in a rapid response environment, there is a critical need to ensure that standardisation is enforced if you are to limit the proliferation of different look and feel interfaces. It also means that corporate quality test teams can reuse some of their previously-written test code and help maintain the increased turnaround for development.

The Application Wizatron has been well thought through and will guide you through some of the more common choices, such as whether to use buttons or a toolbar for navigation and common operations. You can also allow it to generate reports for every physical file in the database by default and it will build you a standard tabbed window application. The speed of generation is much faster than any of the products that I have used consistently over the last few years. I went through the loop a couple of times, creating different applications using databases I had created myself, as well as importing the Microsoft NorthWind sample database and an extremely complex database belonging to a customer of mine.

As mentioned earlier, the whole of Clarion 5 revolves around its Wizatrons that do the initial creation of everything for you and the Wizatrons that you can develop yourself. Once you are happy with your database structure and the data dictionary, you need to move forward and create customised procedures to add, update, browse, and delete records. The easiest way to access this information is through the Application Generator interface; it contains links to all of the other Wizatrons. In the documentation, TopSpeed has provided a useful diagram that details all the relationships between the key components within Clarion 5.

Adding screens is easy and the window editing controls have been kept clean. The first thing you notice is that when you work with a screen Clarion 5 puts up a background template showing you the room you will have for different resolutions. One of the common failures of applications during testing is that components appear off the screen and users are expected to scroll around to find stuff. Any proper design document should mention the target screen resolution for an application and by providing a background template TopSpeed has improved the design capabilities. This works well when going through an early cut of an application with users who often do not understand why they cannot see all their fields and controls on a single screen when they have a low-resolution monitor. I have even known organi-

sations design different versions of an application to deal with low and high-resolution screens.

Adding a control to the screen is as easy as with any other RAD tool, but unlike some that then provide you with a long list of properties, Clarion 5 uses a tabbed properties dialog and splits the possible options into more manageable chunks. The Wizatron walks you through adding predefined procedures as well as assigning actions to the buttons that other products leave you to build yourself. As a result of the way the Wizatrons work, they are all interlinked and able to call each other. This allows you to drive deeper and deeper into the functionality behind a button without actually writing any code.

An example of this is using the Browse Wizatron, which creates all the code necessary to work with a file. You specify the name of the file, the primary key, whether the user can update or just view data, and how to deal with related files such as a parent record. This kind of extended functionality was quite cool, but I had to stop and think through where I was actually going with my application. If you are developing without a specification, it is easy to see how the Wizatrons could start to take over and make your application more and more complex when it may not actually be required.

The simplicity of adding controls is evident when you add fields to your screen. The standard toolbox provides drag and drop for fields and a comprehensive set of properties in their own tabbed dialog. Once again, I found this much easier to work with than my previous experiences with competitor products such as Delphi and Centura.

The one thing that did cause me concern is that I could see no way of linking the buttons back to a set of predefined classes. In other products I use, I have a set of classes that cover basic Exit, Left, Right, First, Last, OK, and Cancel buttons where the code has been tested and I can control the overall application look and feel.

With Clarion 5 I felt I was always using the supplied code unless I wanted to cut and paste into each control, until I located the template configuration utility.

### Templates

If you take the Application Template Utility, you can begin to customise all of the built-in templates. These cover buttons, taskbars, built-in behaviour, screen design, and all of the components that you will generally use throughout the application build. At this point, should you select an object you get the long property list that you generally associate with Delphi or Visual Basic. Gone are the tabbed dialogs and this seems a little unfortunate. TopSpeed appears to have sacrificed some of the niceties of the overall interface just because you are now working behind the scenes. This behaviour seems to happen in other tools I have come across and it just makes it look as if the vendor couldn't be bothered to actually finish the product off.

What did surprise me was the depth to which the templates go. You don't just go in and alter a single template that will affect your application; you actually have one template per Wizatron. This means that you can even design your own Wizatron to carry out specific design functions as well as tune and redesign those supplied with Clarion 5 (see Figure 3). The Wizatron manual contains some basic tutorials for using and editing these components and this can easily be used as a starting point for writing your own Wizatrons. If this product is to become accepted in large corporate development environments, then these tutorials and the sample code need to be extended much more. This is where the power





really resides with Clarion 5 and TopSpeed needs to address this as soon as possible and a simple rewrite of the existing documentation could go a long way towards that.

The programming language behind Clarion 5 is clean and easy to use although adding code to an existing application can take a little getting used to and this is another reason why you need to consider tuning the templates. When you choose to add code to an object in Clarion 5 you are put into the embedded source window. This is clear, easy to navigate, and, like its competitors, uses colour-coded syntax. Unfortunately, there are large sections that you cannot edit. When trying to recreate an application that I had developed elsewhere, I found myself having to go back to the template, make the changes to initial behaviour, and then recreate the component.

The depth and functionality of the language was more than adequate for the project that I converted from Centura. However, I did feel that I was drowning under the large number of options that seemed to accompany many of the commands. Reading Ken Barrington's introduction to the programming manual makes you realise how the language has evolved and from where it seems to draw its inspiration.

While I found this time consuming it made it very clear that there was a distinct need to spend time carefully planning how to use Clarion 5 if I was to get any benefit out of it. I wonder how this will be perceived by corporate design teams who often have very limited time available to get familiar with a product. In the long term, I would expect them to like what they see, with more development being done by small teams that need to be given easily-controlled templates to be able to exploit the power within Clarion.

## Add-ons

Clarion has a number of add-ons that allow you to extend its capabilities. With the huge amount of development currently taking place in the financial sector, TopSpeed has ensured that they ship a reasonably fully-functioned financial and business maths library. Like the language reference, the layout and descriptions of the functions are clear and almost all have a worked example.

Another add-on is the Internet Connect product that allows you to build web-based applications. Like with the main Clarion 5 environment, the Application Wizardron is used to generate the application but you will need to ensure that the Application Broker is already installed before you begin. The Wizardron proceeds as if in a normal application, but it will give you the option to deploy as either a Win-

dows, Web, or Dual application, although the latter will limit the deployment platforms to 32-bit. For those developing for older clients, you will need to avoid the Dual option. Just like developing an application for the desktop, you are able to execute and test your application at any time, but you will need to check your setup.

Many corporate developers, however, will have departmental applications that they want to move to a web environment and this is easily achieved with Clarion 5. All you need to do is add the Internet Application Extension into your Application Tree and then recompile the application. Quick, simple, and an opportunity to provide a steady stream of development for the corporate intranet while you rewrite the more complex applications.

This add-on provides support for cookies, HTML, DHTML, and Java although, at this point, there are no announced plans to provide support for XML. If TopSpeed is to make Clarion Web Connect a serious player in this fast emerging market, it will have to ensure that it brings forward any XML plans that it currently has or risk getting left behind as the opposition release updates to their RAD tools.

## A corporate concern

Overall, I like Clarion 5 because it did simplify several of the coding problems that I was facing. The presentation was good and when I really needed technical support it was available from people who understood the product. However, with the UK support coming from Contemporary as the local distributor, corporate customers will be looking for an extended support deal that will provide access over longer hours than

is currently available. More work also needs to be carried out on the knowledgebase and one solution to this would be to ship an updated copy of it on a CD to all registered developers every three months. This could be combined with any service releases and paid for by charging a marketing fee to the third-party developers so that limited edition copies of their tools could be shipped at the same time.

Internationalisation of the documentation and improved tutorials, including electronic tutorials, need to be added. (I know that there are new people already in place in the US to address just this issue. Hopefully, we won't have to wait too long to see the results.) And there are several little things that were irritating: error messages that could have been included, better design infrastructure, and a finishing off to some of the Wizardrons. But given where the product is, this should not take a long time and it would just take those rough edges off.

My only real concern is how to pitch the product at the corporate development market. Yet the same problem is true to some degree of PowerBuilder, Centura, and Delphi although they have all generated a third-party contractor market that is still lacking with Clarion. If you are looking at a new development and are in the market for a new RAD tool, then I would consider finding time to give Clarion a once over.

*Ian Murphy is a freelance journalist and trainer because it means getting lots of toys, access to some neat technology, and gives his ego an outlet. When pressed, Ian will go out and do consultancy. You can contact him at [ianmurphy@fleet-street.com](mailto:ianmurphy@fleet-street.com).*

*The Clarion Enterprise Edition 5.0 is available from Contemporary ([www.contemporary.co.uk](http://www.contemporary.co.uk)) for £995 (upgrades £650). The Professional Edition 5.0 costs £495.00 and the Clarion Web Edition 5.0 £1,250 (upgrades £875).*

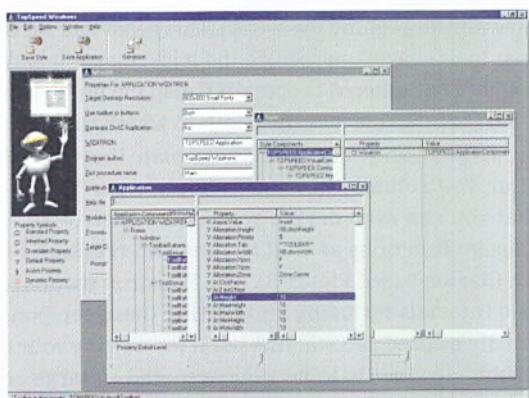
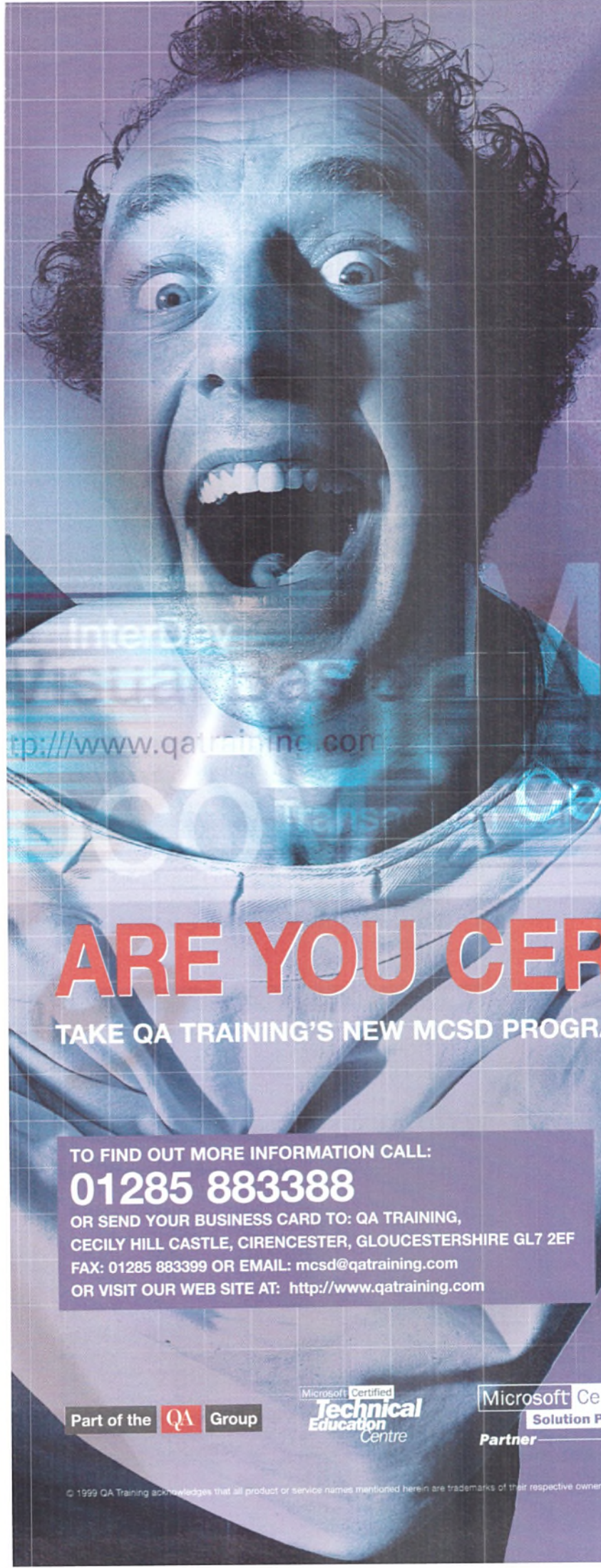


Figure 3 - Defining the Wizardrons.





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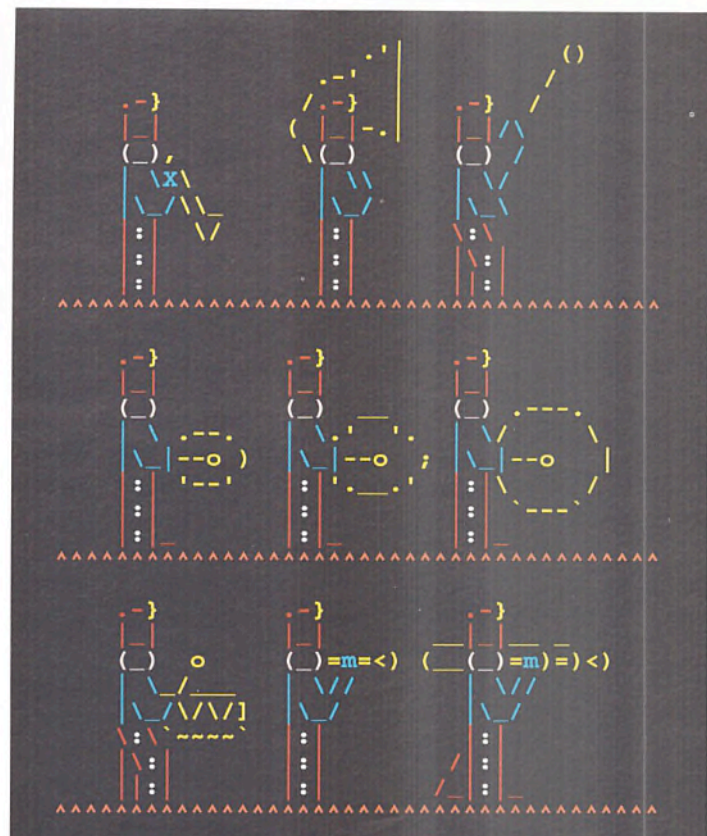
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# A media fanfare

Dave Jewell delves inside the SwiftSoft Packs of Multimedia Tools. He finds components that can add a lot more than bells and whistles to your application.



**M**ultimedia controls of fabulous beauty and cleverness'. This verdict was recently pronounced by Will Watts, well-known denizen of the Borland conference on Cix, and one-time editor of this illustrious publication. If you inhabit the `delphi.links` topic of the aforementioned conference, you'll know that Will is rather keen on the SwiftSoft Multimedia components and he's not the only one. But I fear that I'm getting ahead of myself already. What are the SwiftSoft Multimedia Tools, and why all the fuss?

SwiftSoft Multimedia Tools is a comprehensive library of VCL components aimed primarily at Delphi and C++Builder developers, with a particular emphasis on incorporating multimedia capabilities into applications. Having said that, Visual Basic and Visual C++ programmers needn't turn the page just yet – many of the SwiftSoft components have already been made available as ActiveX controls, and more will follow, thus making it possible to use the tools in non-Borland development environments.

## Delphi meets WinAMP...

Just to get you in the mood, feast your eyes on the screenshot in Figure 1. At first glance, you'd be forgiven for thinking that this is the popular WinAMP audio player (available from <http://www.winamp.com>, in case you've never heard of it). However, it's actually a native Delphi application called MPKitDemo created using some of the SwiftSoft tools. In this particular case, the application is playing an MP2 audio file, and the SwiftSoft components provide support for playback of MP1 and MP3 in addition to the more usual stuff. You may notice that the bottom panel of the program is showing a real-time oscilloscope trace of the actual waveform being played, while the panel above is displaying an instantaneous frequency spectrum of the audio file. Although it's kind of hard to show in a magazine (!), the peak levels in the spectrum display decay gracefully just like you'd expect to see on a real-world instrument. Above the spectrum display is a graphic equaliser, and above that are the usual controls, such as play, stop, rewind, fast-forward, and so forth.

As with WinAMP, you can select different 'skins' to change the appearance of the player completely. Each skin defines not only the bitmaps used by the various controls, but also the location of the different controls. If you want to play around with MPKitDemo, you can download a fully-compiled executable from the SwiftSoft website at <http://www.swiftsoft.de>. The source code of the application is available to registered users of Multimedia Tools.

The various SwiftSoft components are contained in no less than thirteen different 'Packs', which can be purchased on an individual basis or in various combinations to save money. A list of currently available Packs is given in Table 1.

I should point out that the price of the various Packs is somewhat variable. For example, the Basic Pack on its own will cost \$49 without source code or \$99 with source code. (SwiftSoft is a German company, and all quoted prices are in dollars or marks.) On the other hand, the Visual Pack will cost \$199 without source or \$399 with source. The HD-



Figure 1—This is SwiftSoft's answer to WinAMP, complete with the ability to play MP1, MP2, and MP3 files, and even a facility for changing 'skins'. All written in 100% Delphi – not a DLL or an OCX control in sight...



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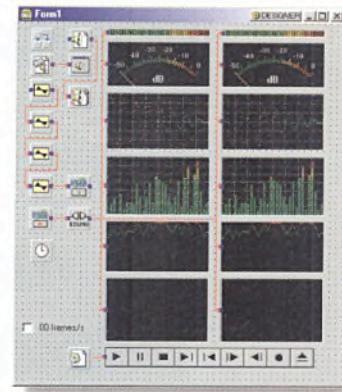


Recording pack is the most expensive package, available only on special request, and the author has indicated that the price starts at \$5,000 with 5% royalties on sales of any product incorporating this technology – you have been warned!

### What's in the Packs?

What are all these different Packs, and what do they contain? Let's start with the inappropriately named Basic Pack (which is required by many of the other packs). It contains around 35 different components, many of which are clever and innovative. One of my favourites here is **TMMFastFile**, a component that provides an object-oriented interface to a special file called a 'fast file'. You can think of it as something like a ZIP file in the sense that it allows you to encapsulate an arbitrary number of logical files within a single physical file. In those cases where an application needs access to several different data files (eg WAV files, bitmaps, configuration data, etc) this approach can simplify software installation by shovelling everything into one file. With typical Germanic attention to detail, the **TMMFastFile** component is complemented by a design-time property editor, which you can use to create fast files and place other files inside them. That said, there's a complete set of methods for creating, accessing, and modifying fast files at runtime. The biggest thing **TMMFastFile** lacks is a data compression facility, but I've spoken to Ronald Dittrich (SwiftSoft's developer) about this and, with luck, he may add compression to a future version of the control.

Another very tasty control in the Basic Pack is **TMMDesigner**. As the name suggests, this component really comes into its own at design-time, rather than at runtime. If you look carefully at Figure 2, you'll see that this is actually a design-time form, as evidenced by the presence of the grid on the form background. However, you'll notice that the form is showing a series of interconnecting lines between related components. The **TMMDesigner** component is a way of managing and representing the relationships between individual controls on a form. For example, most Delphi and C++Builder programmers are familiar with the task of connecting a **TTable**, a **TDataSource**, and one or more data-aware controls. This is a relatively simple relationship, but the SwiftSoft components allow much more complex patterns of interconnection to be realised. In Figure 2, a **TMMWaveIn** component (immediately above the Timer) is being used as input to a **TMMConnector**, which acts as a 'one



**Figure 2 – One of the many innovative features in SwiftSoft Multimedia Tools is the TMMDesigner component, which allows the design-time form to show links between inter-related components. You can even use it to drag connections from one component to another.**

to many' patch board, routing a signal source to many other controls – in this case, no less than twelve! This demo program graphically displays the left and right audio outputs from a PC's CD-ROM in several different forms. From top to bottom, you've got a stacked array of LEDs, a level meter (complete with peak indicator), an oscilloscope trace, a spectrum display arranged as a bar graph, another spectrum display, and finally a spectrogram. The spectrum display can be configured to behave in a variety of ways according to its **Kind** property. In the case of the bar graph, **Kind** is set to **skBars**. In the row beneath, it's set to **skScroll**, which causes successive spectrum lines to scroll down, creating a sort of three dimensional 'sound terrain' effect.

The **TMMDesigner** component (which, as you may have guessed, works by subclassing the design-time form) is extensively used in the various SwiftSoft demos, and can be configured to display interconnecting lines with adjustable width and colour. If you place a few 'connectable' SwiftSoft components onto a form, and then drop a **TMMDesigner** onto the form, all the connectable components will suddenly grow little grabbing handles on their sides. You can then form interconnections by clicking and dragging these handles from one component to another. Magic! Personally, I really think that Borland ought to get off its laurels, take a tip from SwiftSoft, and add this functionality to the IDE itself. It would then only be necessary for a component to register itself with the form designer for this sort of design-time niceness to be available right through the VCL hierarchy.

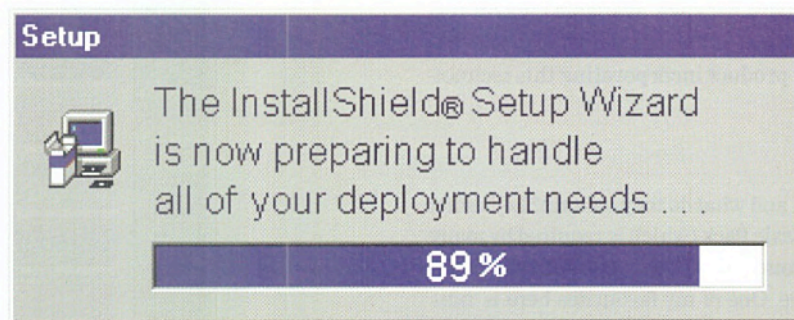
In SwiftSoft's Basic Pack even the humble label control is anything but basic. We've all come to expect goodies such as rotation through arbitrary angles, raised and sunken effects, and highly configurable border styles. But the SwiftSoft offering goes further by allowing you to specify a bitmap, which is then used to fill the interior of each letter. Obviously, this particular option is only appropriate for creating decorative effects with large font sizes. Another control, **TMMMemMapFile**, provides a simple wrapper around the Windows API routines needed to memory-map a file, allowing you to treat it as an in-memory object. Of course, seasoned Delphi/C++Builder developers will argue that the same thing can be accomplished with **TMemoryStream**, but this doesn't use memory-mapped files, making it less appropriate when working with extremely large files.

Still in the Basic Pack, there's an enhanced slider control, which provides owner-draw capabilities for both the groove and the thumb parts of the control. I suppose you could use this to achieve WinAMP-style effects where the colour of the groove changes from green through orange to red as the thumb position is increased. There's also

| Package       | Description                                |
|---------------|--|
| mmbasic.html  | Core components                            |
| mmdesign.html | Components for a unique application design |
| mmwave.html   | Components to work with wave data          |
| mmvisual.html | Visualisation components                   |
| mmmixer.html  | Components for a soundcard's mixer         |
| mm3d.html     | DirectSound (3D) support components        |
| mmavi.html    | AVI file handling components               |
| mmhdrec.html  | HD-Recorder building blocks                |
| mmmpeg.html   | MPEG (Layer 1,2,3) audio decoder           |
| mmfilter.html | A set of audio filters                     |
| mmeffekt.html | A set of audio effects                     |
| mmcdrom.html  | Components to work with CD-ROM             |
| mmpcx.html    | Digigram PCX Card MPEG components          |

**Table 1 – The currently available SwiftSoft Packs.**





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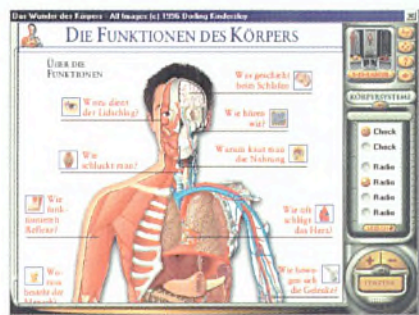
a canned progress dialog, a high-resolution timer, custom edit controls specifically for entering numeric data, a fancy rotatable-wheel control, a neat little colour button just like the one you'll find on the Appearance tab of the Display Properties applet, and even a specialised control for converting an existing VCL form into a screen-saver – complete with preview window!

But I could easily devote this entire review to the contents of the Basic Pack – we need to move on. Next on the Component Palette is the Design Pack. The emphasis in this package is on elegant user interface design, with eleven different controls in the Pack. There's another slider, a radio button, a checkbox, and a push button, all of which (unlike the built-in Windows API controls) are designed with transparency in mind, thus allowing a custom form background to show through. This transparency can be used to create some very spectacular effects, as can be seen from the example in Figure 3. In the case of the slider, separate bitmaps can be used for the control background and for the moveable thumb area. All of these controls refer to bitmaps by designating an index into another component of type `TMMBitmapList`, which is also a member of the Design Pack. As with the plain-vanilla `TImageList` component, this VCL class allows you to store persistently an arbitrary number of bitmaps. However, `TMMBitmapList` improves upon `TImageList` by allowing you to store many bitmaps of differing sizes, and it has import/export facilities for reading/writing its contents to a special bitmap list file (extension `EML`). This makes it easy to share a collection of 'standard' bitmaps between several different projects or move it from a 16- to 32-bit project.

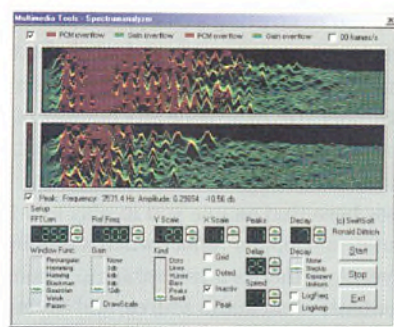
Note: this would be a good point to emphasise that many of the controls included in the SwiftSoft collection can be compiled under 16-bit Delphi as well as 32-bit Delphi and C++Builder. Although the source includes a certain amount of assembler code, Ronald Dittrich has cunningly used a set of assembler macro definitions to write code that's compilable ('assemblable?') with both 16- and 32-bit tools.

The Design Pack has a number of other controls that work with the `TMMBitmapList`, including a control for tiling a form with a bitmap, and a scrolling text control that is designed to pick up its character set from a bitmap rather than a standard Windows font. This control, `TMMBitmapLabel`, is compatible with the character set bitmaps used by WinAMP skins.

The Wave Pack contains another assortment of 27 different controls which, unsurprisingly, are primarily concerned with wave file playback and recording, being based around the concept of a DSP (digital signal processing) pipe that holds the waveform data. To play a wave file, you can simply set the `Wave.FileName` property of a



**Figure 3** – Here's an example of what can be done when you go to town with the Design Pack. All the user interface gizmos on the right of the screen are implemented using transparent controls with custom bitmaps. You could completely change the 'look' of the user interface simply by using a different set of bitmaps.



**Figure 4** – This demo program illustrates how to use the spectrum control in 'scrolling' mode whereby successive frequency samples scroll down, with new ones being drawn above. The demo also illustrates some of the user interface controls included with the Basic Pack.

`TMMWavePlayer` component, call the `Play` method, and off you go. More typically, you might attach the 'output' of the wave player to a couple of meter controls, so that you can monitor each channel. Another component, `TMMWaveRecorder`, can be used to create `WAV` files from another sound source. Other components are provided for accessing wave data in a `BLOB` field, and there are a couple of custom open/save dialogs with built-in sound-preview facilities. As well as adding multimedia facilities to your programs, a big emphasis in the component library is on multimedia editing. This being the case, one of the Wave Pack demos shows how to use the oscilloscope component (`TMMScope`) in various ways: zooming in on a section of a waveform, displaying the waveform envelope, showing spikes, and so forth.

I've already introduced most of the controls in the Visual Pack in the previous discussion; in addition to a 'stacked-LED' level control, it includes an oscilloscope, meter, level scale, spectrum, and spectrogram. There's also a rather odd-looking `TMMLight` control containing three light sources (red, green, and blue) that pulsate in time to the audio waveform – a sort of sixties disco effect whereby the three lights represent the current bass, middle, and treble amplitudes. This was the only control in the group that I found rather uninspiring. Figure 4 shows a rather more impressive effect – this is the 'sound terrain' effect that I alluded to earlier. It's a snippet from Beethoven's *Pastoral Symphony*, 5th Movement, but I expect you've already spotted that! This screenshot also illustrates some of the other SwiftSoft gizzmos that I haven't shown elsewhere – look at those cute sliders, spin controls, and LED displays.

### Mixer magic

Another eighteen controls are present in the Mixer Pack, which is primarily oriented towards controlling the various line parameters of a PC sound card, such as MIDI balance, line-in balance, recording balance, and so forth. A number of mixer-specific variants of slider controls, rotatable wheel controls, checkboxes, labels, etc. are provided here. This might sound rather redundant, but there's a considerable amount of method to Dittrich's madness. If you drop a `TMMixerBlock` component onto a form, you get what looks, at first sight, like an ordinary panel. However, like a panel, a mixer block component acts as a container for other controls, allowing you to add mixer-specific checkboxes, labels, sliders, and other content. The whole block is treated as a single unit, meaning that you only need to link the block up to a `TMMAudioLine` component – all the internal controls within the block are linked *automatically*. This means that you avoid the rat's nest of interconnections that would otherwise be required. Similarly, the slider control will automatically control the volume of its parent mixer block, the checkbox will provide muting, and so on – all without the need to



write any code. If you're creating a complex mixer-style application, this architectural design can save a great deal of effort. And naturally, once you've created one mixer block, you can just copy and paste it in the Delphi/C++Builder IDE to provide any number of extra channels.

The DirectSound Pack provides a set of powerful, object-oriented wrappers around Microsoft's DirectSound interface. There are some impressive demos here that enable you to play WAV files at variable speeds and simulate a 'Doppler' effect when a moving sound source passes an observer. And there's a TMMDSCaptureChannel control for capturing the contents of an audio source, and saving it as a WAV file – this is one of the several ways that the SwiftSoft controls provide to capture tracks from an audio CD.

One of my favourites is the AVI Pack. This contains a number of components for playing AVI files – not those wimpy little AVI animations like you see when Explorer is copying/searching for files, but full screen sound and video! You can see one of the demo applications doing its stuff in Figure 5. The various tools in the AVI Pack will let you play AVIs, stream them out to files, compress them, and work with individual frames. In the illustration, the top area of the screen is a component of type TMMAVIVideoDisplay, while the lower panel is a single component of type TMMAVIControl.

Then there's the PCX Card Pack. This has actually nothing to do with graphics file formats. It refers to the PCX MPEG sound cards manufactured by Digigram. (See <http://www.digigram.com> for more details.) If you have one of these cards, or you're writing software for users who do, this Pack contains a number of components for accessing the hardware-specific capabilities of these cards. The Filter and Audio FX (Effects) Packs are obviously aimed at sound manipulation and include wave mixers, reverb effects, delay, a phaser and phase shift component, flanging, and pitch modification. Finally, there's the MPEG pack (which I've already mentioned in passing – its primary purpose is to allow playback of MPEG Layer 1, 2, and 3 audio files), the CD-ROM pack for reading track data from a CD, and the HD-Recording pack, which provides facilities for creating fancy recording applications with multi-track cut-boards, digital track mixing, and more.

I mentioned at the beginning of this review that many of the SwiftSoft components are available as ActiveX controls. If you know much about Delphi and C++Builder, you'll appreciate that these development systems don't make it easy to create an ActiveX component from scratch. Instead, they're oriented towards taking an existing VCL control and putting a wrapper around it that makes it look like an ActiveX control to the outside world. Although this works reasonably well,



**Figure 5 – The AVI file player was created using just two components from the AVI Pack. The control unit at the bottom of the screen is highly configurable such that you can remove various elements of the controller and even change the colour of the LEDs.**

you'll often find that particular properties aren't visible in (for example) Visual Basic or Visual C++ because the type of the property isn't automatable. As a general rule, converting a VCL component to work as an ActiveX control is rarely a one-step process but often involves a certain amount of 'tweaking'.

If you're seriously interested in getting into VCL-based ActiveX component creation, then I'd recommend that you purchase the source code to the SwiftSoft components that interest you. Not only is this a good idea anyway (security, porting to future versions of Delphi, etc) but you'll find that the source code contains a small number of judiciously placed conditional-compilation statements that will teach you a lot about the best way of organising controls such that they can be cleanly compiled for either 'native VCL' or ActiveX usage.

#### Time to start digging....

I must apologise for the brevity of some of the Pack descriptions, but as you'll have gathered by now, the SwiftSoft Multimedia toolkit comprises a huge number of components and there simply isn't the space to give everything a fair crack of the whip. In this review, I've tried to concentrate on those aspects of the toolkit that I've personally been impressed by, and which I understand well enough to discuss. Understand? Well, yes... This leads me on to the biggest shortcoming of the SwiftSoft tools – a complete lack of help documentation! Creating help files can be seriously boring when compared with coding, but it is still a very *necessary* evil. Unfortunately, there is no official documentation on any of the components in the SwiftSoft library, and this must represent the biggest drawback with the product.

On the positive side, the author has written over 150 different demos that comprehensively showcase the different components in the various packages, and it's a good idea to examine these carefully in order to glean more details of the capabilities of each control. Doing so will go a long way towards making up for the lack of documentation. If you check out the SwiftSoft newsgroups (the server has an IP address of 194.184.27.28 – there doesn't seem to be any domain name), you'll find that a number of enthusiastic SwiftSoft users have been writing HTML-based documentation for some of the available Packs (spurred on by the offer of free source code for the package that they're documenting). The bad news is that many of these people don't appear to be native English speakers, and the amount of effort that's been expended in creating documentation looks suspiciously like the absolute minimum needed in order to acquire the coveted source code. You will gain more insight from perusing the demo programs, and from the helpful advice of Ronald Dittrich in the SwiftSoft newsgroups.

To conclude then, the SwiftSoft Multimedia Tools do indeed comprise a library of 'fabulous beauty and cleverness'. It is a treasure chest brimming with goodies for all serious Delphi/C++Builder developers. (And if you factor in the ActiveX stuff, other development systems too.) But as with all buried treasure, a certain amount of digging is required, and all the more so bearing in mind the lack of documentation. Nevertheless, those who persevere will be richly rewarded...

As mentioned above, the SwiftSoft website is at <http://www.swift-soft.de>. Here, you'll be able to download trial versions of the software (including ActiveX variants), the numerous demo programs, and that deeply cute WinAMP clone, as well as checking the latest prices for single Packs and bundles.

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| Luxent Docs & Images Annotations | £365    |

### NuMega (CompuWare)

|                      |           |
|----------------------|-----------|
| CodeReview Pro       | £295      |
| DevPartner Studio VB | £420      |
| FailSafe Pro         | £295      |
| Soft Ice             | from £349 |
| TrueTime VB or VC++  | £295      |

### Pegasus (ImageFX)

|                              |      |
|------------------------------|------|
| CapturePRO                   | £135 |
| FractalFX VBX                | £265 |
| FXTTools Gold                | £265 |
| ImageN DLL or VBX or ActiveX | £265 |
| ImageXpress                  | £599 |
| RivetText                    | £69  |
| SuiteFace                    | £265 |
| VectorFX 32 bit OCX          | £245 |

### Protoview

|                      |      |
|----------------------|------|
| ActiveX Suite        | £289 |
| Data Explorer 32 bit | £175 |
| DataTable OCX & DLL  | £175 |
| WinX Library         | £145 |

### Sheridan

|                                |      |
|--------------------------------|------|
| ActiveListBar                  | £95  |
| ActiveToolbar&Menu             | £110 |
| ActiveThreed Plus              | £125 |
| ActiveTreeView                 | £129 |
| ActiveSuite                    | £379 |
| Calendar Widgets               | £90  |
| ClassAssist                    | £195 |
| Component Suite (Cal+Data+Des) | £229 |
| Data Widgets                   | £175 |
| Designer Widgets               | £95  |
| Sp_Assist                      | £375 |
| VB_Assist                      | £125 |

### TideStone (Visual Components)

|                          |      |
|--------------------------|------|
| First Impression ActiveX | £199 |
| Formula One v6 Pro       | £59  |

|                                       |              |
|---------------------------------------|--------------|
| Borland C++ 5                         | £225         |
| Borland C++ 5 Dev Suite               | £315         |
| Borland C++ Builder 4 Std             | £75          |
| Borland C++ Builder 4 Pro/Upg         | £389/220     |
| Borland C++ Builder 4 CS/Upg          | £1529/1109   |
| BoundsChecker Pro C++                 | £399         |
| CC Rider 16/32/bundle                 | £220/300/400 |
| C-Vison from Gimpel                   | £179         |
| Codebase 6.3                          | £330         |
| Dart Power TCP Internet Toolkit 16/32 | £399         |
| DevPartner Studio for Visual C++      | £535         |
| Great Circle Debugger Pro             | £535         |

## EXTENDED

|                                    |       |
|------------------------------------|-------|
| Advantage DB NetWare Srv 2 user DK | £215  |
| Advantage DB NetWare Srv 5 user    | £645  |
| Advantage DB NetWare Srv 25 user   | £1795 |
| Advantage DB NetWare Srv 100 user  | £3145 |
| Advantage DB NT Srv 2 user DK      | £215  |
| Advantage DB NT Srv 5 user         | £645  |
| Advantage DB NT Srv 25 user        | £1795 |
| Advantage ODBC Client kit          | £195  |
| Advantage API Client kit           | £105  |

## YEAR 2000

|                             |               |
|-----------------------------|---------------|
| Centennial                  | from £24/user |
| Total Access Inspector 2000 | £375          |
| Y2KFOX                      | from £265     |
| Year 2000 Detective         | from £125     |

|                          |      |
|--------------------------|------|
| Visual Components Studio | £229 |
| Visual Speller OCX       | £95  |

### VideoSoft (Upgrades available)

|                    |        |
|--------------------|--------|
| VS Data ActiveX    | £115   |
| VS Direct          | £120   |
| VSFlexgrid Pro     | £165   |
| VS Reports ActiveX | £80    |
| VSVBX/VSOCX        | £50/80 |
| VSView OCX v 6     | £170   |

### Utilities - Help Systems

|                       |          |
|-----------------------|----------|
| AnswerWorks 3         | £375     |
| Doc-To-Help v 4/Pro   | £315/450 |
| ForeHelp 3/ Premier   | £249/440 |
| Help Magician Pro     | £199     |
| RoboHelp Classic 7    | £345     |
| RoboHelp Office       | £650     |
| SOS Help! Info Author | £185     |

### Utilities - Other

|                                   |            |
|-----------------------------------|------------|
| Seagate Backup Exec               | from £395  |
| Crescent PDQComm OCX              | £125       |
| Crescent QuickPak VB/I            | £149       |
| Crystal Reports Pro v7/Upg.       | £249/£139  |
| Crystal Comm 32 (+source)         | £135/(275) |
| Cryptor encryption                | £199       |
| DemoShield 5.4                    | £295       |
| DemoQuick 16/32 bit               | £575       |
| Dynamic Update                    | £199       |
| ExtraFax for Lotus Notes Std/Lite | £669/399   |
| InstallShield 5.5 Pro             | £480       |
| InstallShield Express Pro         | £145       |
| Luxent WebGrid Pro                | £300       |
| List & Label for VB               | £225       |
| List & Label 16/32 bit            | £345       |
| PC-Install Win                    | £145       |
| R&R ReportWriter xBase 32 bit v 8 | £239       |
| Shrinker 3.0                      | £99        |
| soft SENTRY                       | £375       |
| Wise InstallMaker/Builder         | £125/£250  |
| Wise InstallMaster/Manager        | £500/£1125 |

### Misc

|                                   |                 |
|-----------------------------------|-----------------|
| 3D Graphics Tools 16/32 VB/C++    | £285/299        |
| ActiveDelivery Std/Pro            | £165/249        |
| Address Rapid Addressing SDK      | £149            |
| Aegis v 3.6 1-5 user              | £350/user       |
| Basic Constituents                | £119            |
| Chart FX 98                       | £289            |
| Chart FX 16/32 bundle             | £245            |
| DBest Barcodes for Win 16/32      | £345/375        |
| DistKit Software Protection       | £100            |
| ED for Windows v 3.8              | £135            |
| ErgoPack for VB, VC++ and Delphi  | £225            |
| Erwin Desktop for VB              | £395            |
| Graphics Server 6                 | £call           |
| LeadTools/ Pro v 11               | £call/call      |
| Lexia from QBS                    | <b>NEW</b> £150 |
| Map Tools                         | £745            |
| MKS Source Integrity/Pro          | £445/995        |
| MKS Toolkit 95/NT                 | £289            |
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| PVCs Tracker                      | £380            |
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|                                  |          |
|----------------------------------|----------|
| Greenleaf Comm++                 | £199     |
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| IP*Works!                        | £185     |
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| MKS Toolkit                      | £299     |
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| TrueTime Visual C++ Edition      | £375     |
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## WEB/INTERNET/JAVA

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|-------------------------------------|-----------------------|
| Borland Datagateway Pro/ C/S        | £235/949              |
| ClipWeb Std/Pro                     | £135/199              |
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| Cold Fusion App Svr Pro NT          | £895                  |
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| Distinct Vis Internet Toolkit 16/32 | £230/295              |
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| InstallShield 5 Java Edition        | £300                  |
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| Internet Commerce Kit (ICK)         | £165                  |
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| Jamba Professional                  | £189                  |
| JBuilder 3 Pro/ upgrade             | <b>NEW</b> £405/229   |
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| Java Workshop                       | £85                   |
| JCheck (NuMega Labs)                | £334                  |
| JClass BWT/ (+ source)              | £49/(175)             |
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| MS Visual J++ Pro                   | £69                   |
| Multilizer Java Standard/Pro        | £125/250              |
| NetIntellect                        | £150                  |
| Protoview Calendar/ inc. source     | £99/235               |
| Protoview JSuite/ inc. source       | £199/785              |
| SuperCede Std/Pro                   | £75/450               |
| Sybase PowerJ Enterprise            | £385                  |
| Visual Cafe 2.5 PDE/DDE             | £199/585              |
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|------------------------|-----------|
| Adobe PageMill         | £70       |
| ColdFusion Home Site   | £75       |
| ColdFusion Studio      | £279      |
| Macromedia DreamWeaver | £275      |
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| MS FrontPage 98        | £99       |
| NetObjects Fusion      | £195      |
| NetObjects Team Fusion | from £695 |
| Symantec Visual Page   | £59       |

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|---------------------------------|------------|
| ARCserve                        | from £395  |
| Carbon Copy                     | from £135  |
| Distinct Dialup                 | £625       |
| Distinct Network Monitor        | £125       |
| IMail Server                    | from £730  |
| Norman Access Control 5/10 user | £995/1495  |
| Norman Virus Control            | from £69   |
| Norton Utilities 95/NT          | £79/89     |
| Nuts & Bolts                    | from £375  |
| Observer Base                   | £895       |
| pcAnywhere                      | from £75   |
| PGP                             | from £995  |
| Replica                         | from £345  |
| Seagate Backup Exec             | from £475  |
| Seagate D/top Management Suite  | from £1425 |
| Seagate Manage Exec 1/5 user    | £650/2500  |
| SysTrack                        | £945       |
| Total Virus Defense             | from £410  |
| VirusScan                       | from £49   |
| WhatsUp / WhatsUp Gold          | £220/730   |
| WinFax Pro 1/5 user             | £90/349    |
| WinINSTALL                      | from £495  |
| Zero Administration Client      | from £495  |
| Zetafax                         | from £315  |

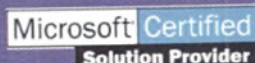
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|                                  |            |
|----------------------------------|------------|
| PowerBuilder 7 Desktop/Pro       | £call/call |
| PowerBuilder 7 Enterprise        | £call      |
| PowerTCP Add-on for PowerBuilder | £99        |

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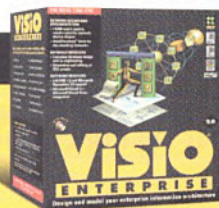




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# Linux world

Ignoring the myths, Peter Collinson explores what Linux has to offer. He discovers Disk Druids, the LILO, and Gnome, but no gnus or penguins.

I must confess that I had not managed to look seriously at Linux until recently. I suppose that I've been put off a little by the hype. Another reason for the evasion is that I've been more than happy with my BSD/OS system. Each release from Berkeley Software Design Inc (BSDI) has been well engineered and the system has sat running my web service and DNS for some six years with no substantial problems and impeccable reliability. My web service has been out of action for about 3 or 4 days in those six years, and none of this downtime is attributable to the system itself. I should say that at one time I was responsible for selling BSD/OS in Europe, but this has not been the case for four years.

Another reason for avoiding Linux was that I've not really had a spare machine on which I could test or use it. However, when the last release of BSD/OS arrived, I came to the conclusion that it was time to replace my web server machine, an ageing 486/33 with 32 MB of memory and ISA Ethernet card. The new Pentium machine cost me significantly less than the original 486, and provides oodles more power. There actually seems to be a great benefit in having a fast CPU, SCSI disks, loads of memory, and a PCI interface card for TCP/IP. Web performance improved magnificently.

The advance of technology has meant that big disks are cheap, but backup technology hasn't really improved. I'd backed up the 486 over the network to my Sun, and allowed the Sun Legato system to store the files on DAT. The web machine was getting to the point where dumping its data over the network was not really viable. To provide some measure of data security, I had decided to buy two SCSI disks for the new setup. Every night I clone the main disk onto the spare disk, using a standard program called `rdist`, which was originally designed to ensure that a set of workstations were running the same code. One machine is designated as the master and

the `rdist` program reaches out from this machine ensuring that other machines contain the same files. To clone a filesystem, I just run `rdist` to `localhost` providing an offset destination filepath to copy all the files under the root of the filesystem to another disk.

If I lose the web machine for any reason, I have a spare working filesystem that I can use, albeit by pulling the disk out of the tower. The plan was to be able to load that disk into another machine, so the original system can be taken out of service and repaired. I decided to buy a SCSI adapter for my Pentium NT system, and since I was buying a controller, I decided that I might as well buy a new disk to go with it. This new platter provided me with a place to put Linux.

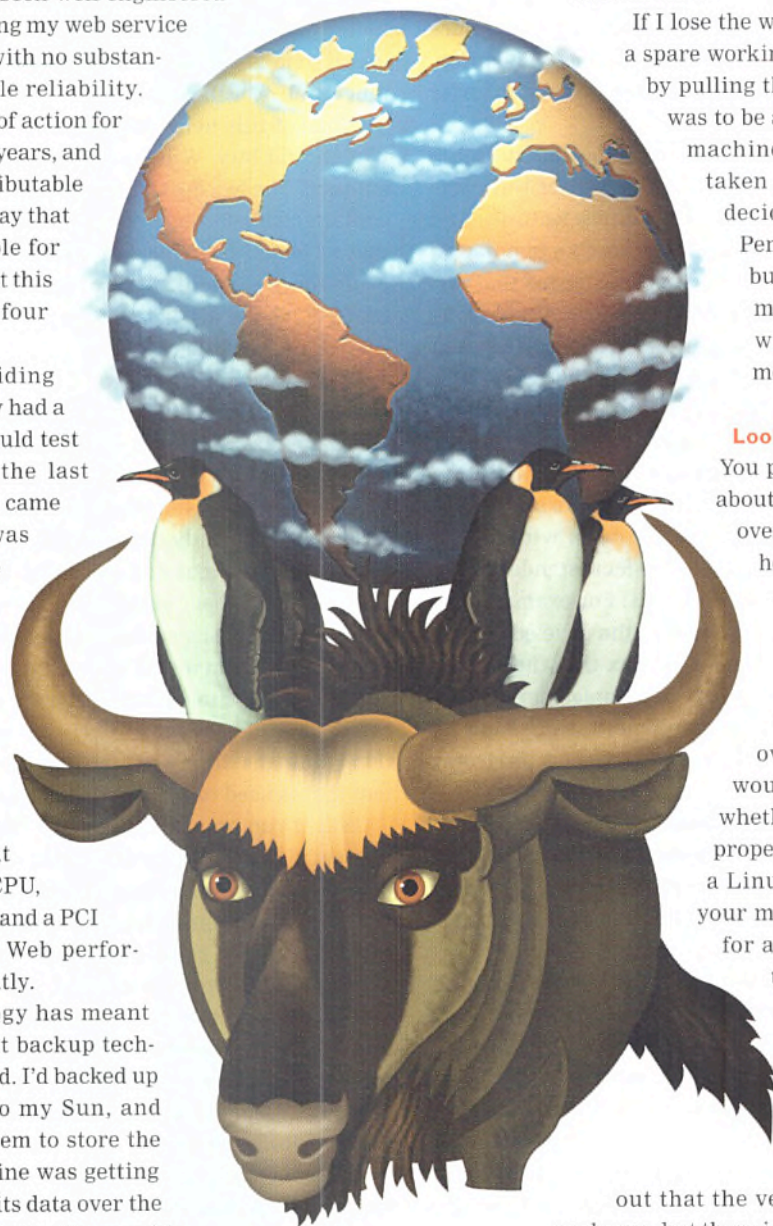
## Looking at Linux

You probably know that standard stuff about Linux; its history, its development over the Net, *etc.*, so I'll avoid all that here. If you don't, then you can visit a Linux website and top up your historical knowledge. Linux is distributed under the GNU Public Licence and can be copied freely. I didn't fancy pulling code over the Net, because I felt that I wouldn't quite know what I had and whether it was configured and working properly. A few organisations generate a Linux CD set that you can install on your machine. I decided to start looking for a preconfigured package because that provides some stability and comes with support.

On the surface, it's deeply confusing that there are several Linux vendors. Surely these people are putting out different systems? Well, it turns

out that the vendors *are* distributing different packages, but there is significant commonality between them. Linux has learnt all the lessons that Unix taught us about system divergence, and starts by leaning on the firm platform that Posix has provided.

The same kernel is used in all the systems and Linus Torvalds is its 'owner'. This means that vendors track the official kernel





releases and this stops them from making gratuitous changes to system calls. This means, at the system call level, that the systems from different vendors are not only source compatible but will run the same binaries.

Binary compatibility is a somewhat complex process these days. Binaries can be compiled 'statically', and will arrive on your machine as complete ready-to-run programs. However, most programs rely on a local version of the C library that is loaded dynamically when the program is run (this is the Unix equivalent of a DLL). There's evidence that there has been two flavours of this library out there in Linux land, but things are stabilising in favour of the Free Software Foundation's ELF (Executable and Linking Format) and the GNU library.

Each package on the CD comes with the same kernel and set of libraries. What else? Well, there is a set of basic Unix commands and utilities. Most of the freely available versions of these programs emanate from the Free Software Foundation's GNU project, and since this is the only source of clones, the CDs contain them. In addition, some systems have been written specially for Linux, and placed under the GNU licence for redistribution.

Of course, there is the question of Unix compatibility in the GNU programs. The people who created GNU clones of Unix programs usually 'improved' on the original, adding new features. And when you are writing something from scratch there's a temptation to fix bugs that existed in the original code, which means that certain idiosyncratic features no longer operate as before. A true clone needs to clone bugs too and be 'bug-compatible'. Well, I suspect that the GNU programs have many areas of difference, but they don't seem to matter much. Unix has always suffered from divergence anyway, and I think that on the whole Posix has made great inroads in defining the desired behaviour: programs will often maintain the bugs, but require you to select 'Posix behaviour' to see them.

Compatibility is also helped because Linux is widespread enough for its behaviour to be considered the de-facto standard. People are changing programs to fit in with Linux. For example, I've been involved with the group that maintains the Jove editor for years. We discovered in the early days of Linux that the person responsible for writing the `curses` library had implemented a feature differently from all known Unix implementations, and he refused to 'add a bug into his code'. The Jove source now programs around this problem.

Linux's networking infrastructure is based on the free code from Berkeley, and most of the basic networking utilities are derived from that source. Other subsystems and commands have been picked up from the BSD releases, and again, since this is the only source for those commands, all CDs will contain the programs.

Finally, we have windowing systems. The glue for the windowing system, the X11 Release 6 source, is freely available. This provides a sample X server, but not one that is tuned to the Intel world, with its plethora of different cards and screens. The only freely available source for an X server is the Xfree86 and most of the CDs contain this. The capabilities of the windowing system are an area where the CD packages tend to diverge. They use the core set of utilities, but tend to pull in different window managers and programs. I suspect that the recently announced Gnome (GNU Object Model Environment) desktop manager from the GNU project is set to become ubiquitous, and will cure this problem.

Hopefully, you will conclude from the above description that all Linux CDs contain a common set of core functions and the vendor will have added some goodies to differentiate their release from any other.

**Compatibility is also helped because Linux is widespread enough for its behaviour to be considered the de-facto standard.**



The situation is further complicated by these vendors placing some portion of their own software into Open Source. For example, Red Hat has developed `rpm`, the Red Hat package manager, which is used on their system to control the installation and removal of software. The `rpm` system is fast becoming a de-facto standard, with `rpm` files popping up all over the Internet.

None of this helps you to make your mind up about which CD you should buy. What goodies will I get on one CD and not on another? The Net doesn't help either; all the pages I have found that contain comparisons are out of date by more than two years, and that's a long time in the development of any system. Stuck with this problem, I elected to go for the Red Hat distribution, largely because it's the market leader.

#### Getting started with Red Hat

The Red Hat distribution arrives in a shrink-wrapped box containing a sizeable book, three CDs, and a floppy disk. The CDs break down into installation, source, and a CD with commercial offerings, such as Corel's WordPerfect package. The commercial programs are mostly time-limited or reduced demo versions. They come in `rpm` format and so can be installed and removed easily. However, at the beginning, you want to get the system installed and running. The first sizeable chunk of the book describes the myriad ways that you can install your Linux system, and is intended to get you up and running quickly. You are advised to read this section of the book at least twice. When you are ready, you bang the boot floppy into the drive and start the machine. This boots a Linux system that is used to install stuff from the CD onto your disk.

Will it run on your hardware? The answer is usually 'yes'. Of course, it's nothing new to have to worry a little about compatible hardware when installing a Unix system. The PC hardware world is full of funny hardware. However, in my case, the PCI interface card for TCP/IP came along with various drivers for Microsoft products on a floppy. In general, apart from these binary drivers, the hardware interfaces are undocumented. Sadly, the driver diskette is useless when installing a Unix system and many Unix device drivers are reverse-engineered by someone painstakingly poking at the hardware, sometimes with a blunt stick, to discover how the device is driven.

In recent times, things *have* become easier. SCSI has been around for some time, and all Unix clones on Intel hardware have very little trouble in driving SCSI adapters. Once they can do that, they can drive disks, tapes, and CD-ROM drives attached to that adapter. Some of the SCSI controllers have firmware that's loaded at boot time, but it seems that Linux can handle that. Furthermore, the PC world has produced the ATAPI interface, which allows the system to support a variety of devices with a compatible interface. On the



# Revolutionizing the Debugging Process

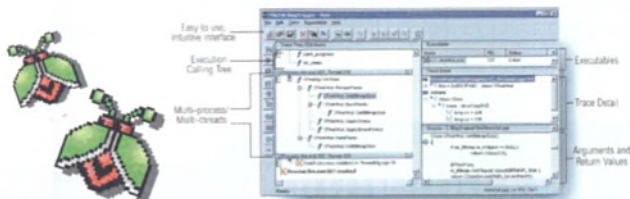
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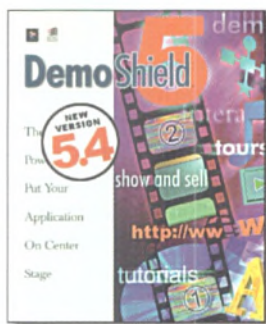
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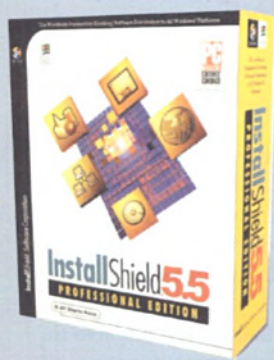
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whole, with Linux, if you have a reasonably recent machine containing devices from major manufacturers (or attached to SCSI or ATAPI controllers that follow the specs), then the chances are that that you can boot Linux.

You don't actually need a CD-ROM drive attached to the machine if you have access to a network. Linux can boot from a variety of sources. You can pull the data from a CD-ROM on another machine on your network, or place the data on the disk of another machine. You can then access that data using the Network File System (NFS) or the standard LAN Manager networking system that's supported by the various flavours of Windows. It's actually possible to pull the boot floppy from the Red Hat site using FTP, and then install the remainder of the system using FTP. If you attempt this installation route, I expect that you will do loads of sitting around being patient. It's probably not something that you want to do if you are connected to the Internet by phone.

Linux provides considerable flexibility for handling the disks that are attached to your machine. Your Linux system can share your disks with other operating systems that may be resident on your system. It comes with a flexible bootstrap mechanism known as LILO, which I certainly associate with uncomfortable plastic inflatable beds, but actually stands for the Linux LOader. LILO allows you to specify which operating system you wish to boot.

I've always been a little queasy about two operating systems sharing one system. I am more worried about the potential problems that can be caused by sharing a disk between those operating systems. However, I think that having loaded the system a couple of times, I would be able to organise a co-resident system installation pretty easily.

However, I must confess that even though I was attempting to be prudent in installing Linux on a brand new empty disk, leaving my extant NT system disk untouched, I still managed to write over the NT system. I did this only once – I don't tend to make the same mistake twice, especially when it takes around a day's work to get my NT system back into a completely usable form. My problems really stemmed from not reading the book carefully enough, or rather skimming rather than reading it. Don't make the same mistake. Although I think that the book is somewhat complex, there are so many possible ways to install Linux that a simple step-by-step guide is hard to create.

I'd always planned to run Linux on my spare disk leaving NT to fend for itself on the other. To boot the system, I could install LILO on the main boot disk and answer some questions to start one or the other system. However, my desire to leave the NT system disk untouched got the better of me. I've chosen to boot the Linux system from a floppy. I remove the floppy when I want to run NT, and allow the BIOS to boot from the ISA disk. I push the floppy into the

**Installation is actually very easy with the Red Hat system. You can have the system up and ready to go in about 20 minutes.**



drive to boot Linux. The kernel is loaded from the floppy, and then the system switches to running from the SCSI hard drive. All this works well, and intuitively.

#### Installation

Installation is actually very easy with the Red Hat system. You can have the system up and ready to go in about 20 minutes. Most of the time is spent waiting for information to be pulled from the CD. If you are using other installation methods, then it will take longer because loading files will run more slowly.

Linux wants to split your disk into several chunks, called partitions. These can map onto the DOS partitions that exist on your system, or several Linux partitions can be placed in one DOS disk segment. It may seem worrying that Linux can see extant (and possibly) used partitions on the disk. If you have a working system in one of these partitions, then you don't want to clobber it. Don't be too worried; this is actually a plus. It means that once installed, your Linux system can obtain files from the other operating systems, assuming that it understands the filesystem layout. The kernel on my system doesn't understand NT NTFS, although I understand that the most recent kernels can actually read files from the NT filesystem.

Red Hat offers two possibilities for programs that are used to configure the disks. They have their own Disk Druid, which is quite simple to use, although somewhat limited because it's aimed at providing a standard setup. They also supply the standard Linux `fdisk` program. I opted to use Disk Druid, largely because it seemed friendlier. It would have been fine, except that its human interface is a little counter-intuitive for the uninitiated. Disk Druid offers two standard disk partitioning schemes: Workstation and Server. It also permits a Custom layout.

My problems stemmed from the fact that I was installing on a separate disk and was forced to use the Custom setup. The GUI makes no suggestions on how large specific partitions should be, so I was stuck. I decided to look at the settings that were established by the other two standard setups and the NT disk was overwritten while I was doing that.

Essentially, the plan for the partitioning is:

- have a partition that's used for swapping, supporting the virtual memory of the machine;
- have a tiny partition starting at the lowest available block on the disk used for booting the system;
- have a smallish partition that's used for the root of the filesystem;
- and split the remaining disk into sensible chunks for other portions of the data that's coming from the CD, leaving space for user files.

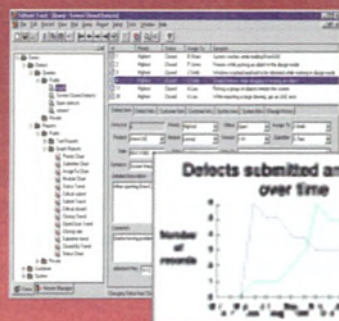
### Web resources

There are loads of Linux pages on the Web, and a great many of them are personal – 'My page of Linux links'. I cannot list them all. A good starting point is 'Linux Online' at <http://www.linux.org>. To peruse Linux documentation see 'The Linux Documentation Project' at <http://meta-lab.unc.edu/LDP>. I actually started looking for Linux things at the Red Hat site, which is <http://www.redhat.com>. I also looked at S.u.S.E, which is a German company that puts out its own Linux distribution from <http://www.suse.com>. You'll find Gnome at <http://www.gnome.org>.

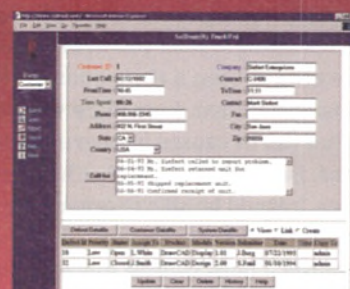




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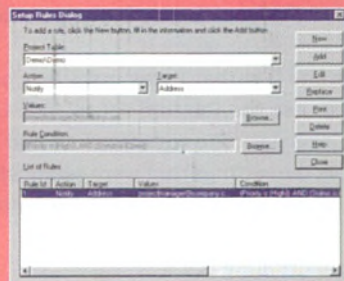
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The default setting puts the swapping partition in the centre of the disk (with the root partition next to it), places the bootstrap partition in the low blocks on the disk, and then splits the remaining space between the other partitions. I suppose that I spent some time in getting the partitions looking right. Once the system is installed, they are hard to alter without starting from scratch again.

The installation process continues by loading the files you need, and it allows you to configure your network and X Window system. At the end of the day, you end up with a fully functioning Unix system that's certainly ready for use as a main Internet server.

#### What you get

What do you get? Well, there's a fully functioning Unix-like system that's completely 'Internet ready' in the sense that it supports all the utilities you would need as an ISP. There is a complete set of Unix tools, and tons of programs that can be used to manipulate and view text, images, and audio in various forms. And there's a fully functioning development environment (not only C and C++ but also many other languages, both old and new).

I am pleased with my Linux system; I have had few surprises, or at least, only nice ones. When I've typed a command 'out of the blue', it's generally been there and worked as expected.

The `rpm` package manager is great; I've used it to update the CD code from new versions that I've pulled from the Web. I've configured, compiled, and installed a version of the kernel. You can run with the generic one if you wish, but can create one that's tuned for your hardware. I've compiled and installed Jove from my sources; this is always a good test of a system, although the program is easily portable to a BSD or Posix environment.

The Red Hat distribution is supplied with three different X Window managers, so you can find a look and feel that you like. It's made very easy to switch between these. I decided that I would test portability by pulling the Gnome desktop manager and installing it. The base binary distribution of Gnome in `rpm` format is about 27 MB, so I left the FTP command running overnight. It's probably not something you want to pull if you are connected to the Internet using the phone system.

Gnome went in very easily; I had to create one file, restart X, and off it went. It's very impressive and should put paid to all those people that say that Linux is not ready for the desktop. It's marginally flaky - I've had the odd thing die on me - but these things do get fixed. However, it seems sufficiently good for me to want to use it full time.

It's hard to find things that are deficient in the system. One problem is perhaps documentation. The system arrives with some

**I have had few surprises, or at least, only nice ones. When I've typed a command 'out of the blue', it's generally been there and worked as expected.**



traditional Unix `man` pages, which of course I am used to. However, there are other sources of documentation, which means that you can end up searching a little too hard for relevant information. GNU has traditionally documented its programs using `texinfo` format. This is approachable if you use the `emacs` editor, and in fact the standard program for looking at this information throws you into `emacs`. Finally, there are several FAQs and HOWTO files stored on `/usr/doc` (these are in text format). The Gnome system provides an interface that integrates these sources together into one GUI. However, this lacks search facilities.

I suppose I have niggles about some aspects of some GUI interfaces. It's a problem that they have been designed and implemented by a huge number of people, so they often differ in what is provided and sometimes contain non-intuitive aspects. Again, I suspect that in time Gnome will stabilise this.

I have more niggles about the source CD that Red Hat supplies. It's not documented very well. There should be a readme file on it that tells you how you are expected to install the source. The Red Hat printed documentation relegates any mention of the source to a section on the FAQ listings.

However, I've had to work hard to find much to complain about. The Red Hat distribution is certainly worth a lot more than you pay for it. If you want something that glues you to the Internet, then Linux is a good contender. I still maintain that not enough is known about NT to make it a really safe choice for putting onto the Internet. If you want a workstation, then Linux is certainly heading in the right direction. ■

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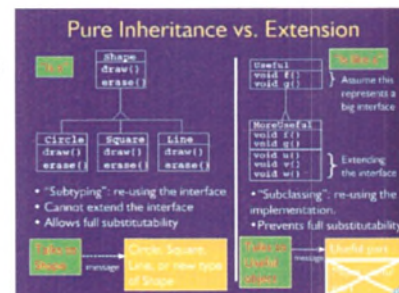
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Bruce Eckel is an award-winning author, chair of the Java programming track at Software Development'98, and one of the most well known independent authorities on Java. Bruce, a 12 year veteran presenter, won the much coveted Software Development Magazine's Jolt Cola Award for programming book of the year in 1996.

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# Casts and conversions

Francis Glassborow examines casting in the object-based world of C++.



Though dangerous, casts are fairly straightforward in C. They explicitly convert a value of one type to a value of another type. Note that C-style casts are concerned with converting values (rvalues in the formal terminology of the language) and nothing else. While some compilers faced with:

```
void example (void * vptr){
    ((int *)vptr)++;
    /* other code */
}
```

do what you expect by incrementing `vptr` to point to the next `int`, they should at least give you a warning because C does not allow you to apply an increment operator to a value. Even if it did, it is the value of `vptr` cast to an `int *` that should be incremented and not `vptr` itself. Make sure you understand the difference, because this is yet another place where we need to discriminate between values and objects. The `vptr` refers to an object of type `void *`. In the appropriate context (and casting is one such) `vptr` is implicitly dereferenced to extract the value of the object. In a sense, lvalues are objects and rvalues are just values.

Things change rather a lot in C++. The new-style casts are much more than new finer-grained ways to write casts. In addition, there are more ways of converting things in C++. Let us look at the latter first.

C++ provides a range of standard conversions that includes all those of C plus such things as conversions from derived type to accessible base (there is no standard conversion to a private base). If there is a standard conversion from type X to type Y, then you may usually explicitly cast (with a `static_cast`) from type Y to type X, though this may not produce the results you expect. However, if you play around with virtual bases, you had better be careful because there are some very unwelcome surprises waiting for you. (I am not going into details here because my first guideline to programmers is to avoid virtual bases until you fully understand what you are doing and are able to take responsibility for your code.)

We all know about the traps that lie in wait for those that cast pointers. (That is why C++ is far more stringent about `void *`. In C++ you can implicitly cast any data pointer to a `void *` but, unlike C, you must be explicit the other way.) Be even more careful if you are tempted to cast a reference. Remember that the normal casts are about values. Contrary to common belief a cast does not mean use an `x` as a `y`.

In C++, sometimes we do want to do exactly that: use an `x` as a `y`. If we are to do that safely, the `x` had better be a `y`. Bjarne Stroustrup invented the `dynamic_cast` for exactly this purpose. At this stage, we move from a value-based perception to an object-based one. We stop being concerned with the value contained in a pointer and start being focused on what the pointer points to. The `dynamic_cast` is statically checked to see if there is an inheritance relationship between the static type of the source pointer (or reference) and the static type of the pointer (or reference) to which you are attempting a conversion. In other words:

```
void fn(typeB * ptr){
    typeA * aptr = dynamic_cast<typeA *> ptr;
    // other code
}
```

will result in a compile-time error if `typeB` is

not related to `typeA` by inheritance. There is a second check at runtime to see if `ptr` actually points to an object for one of whose constituent parts is of `typeA`. If it is, we get back the address of that constituent, if not, we get a null pointer.

The same principles apply when using `dynamic_cast` and references, except that runtime failure has to be handled by throwing an exception. Note that `dynamic_cast` does not result in a conceptually new value being produced because it is concerned with the object being pointed or referred to.

There are two other casts available in C++. The `const_cast` is not about values but about the optimisation/writability of an object. It allows the programmer to add or subtract `volatile/const` qualification to or from an object. It has two main uses. Both are suspect in general but okay if you know what you are doing. The first one is to allow writing to a `const` protected object. The second is to steer selection of an overload resolution towards (or away from) a function that has an (un)qualified parameter.

The last of the new style casts is the `reinterpret_cast`. The long, ugly form is deliberate because it is dangerous in the extreme. Essentially, it represents exactly what many think an ordinary C-style cast does: use an `x` as a `y`. Do not convert values, but convert your view of them.

You should understand why C++ introduced these new casts. The old C-style cast was fine in a value-based world but fell far short of what we needed in a C++ object based world.

## Conversions

The C-style cast (used in a C-like fashion) and a `static_cast` are concerned with values and hence with conversions. Many programmers have a difficulty with understanding where a compiler can find conversions. I have already mentioned the standard ones and their inverses, but there are two other groups of conversions: constructors and conversion operators.

Until relatively recently, any constructor that could be called with a single argument doubled up as a conversion function from the argument type to the class type. This had so much potential for havoc that instructors had to teach students mechanisms whereby they could avoid constructors that could be used with a single argument. These were ugly. Eventually a sufficient number of technical experts felt strongly enough about the subject to fix the problem. Any constructor can be qualified as `explicit`. Doing so prevents it from being used as any part of an implicit conversion from one type to another. You are strongly advised to qualify all your constructors as `explicit` (except, possibly, your copy constructor), even those that currently take multiple parameters – some day a maintenance programmer is going to add some apparently convenient default arguments.

Finally, you can write a conversion operator to convert from the class type to some other type. Time for an example:

```
class Date {
public:
    Date(int day = 1, int month = 1, int year = 1);
    friend ostream & print (Date const &, ostream &);
};
```





```
// other details
};
I have skipped other details irrelevant in
this context. Consider:
int main()
{
    int i=1;
    print(i, cout);
}
```

I know this is simplistic, but I am stripping the code down to illustrate the point. It is extremely unlikely that you intended to treat `i` as a `Date` but that is what the compiler will do. The `print` function needs a `Date const &` and the `Date` constructor can provide one. Even the rules about binding temporaries to references will not help here because they are suspended for `const` references. However, qualifying the constructor as `explicit` would have stopped the compiler using the conversion (unless we explicitly provided the conversion: `print(Date(i), cout);`).

Consider what happens when some bright programmer decides to provide a conversion operator to convert a `Date` into a `long` representing the Julian Day for the date. The following prototype gets added to the class definition: `operator long () const;` Everything is fine until the day dawns when something like the following coding slip occurs:

```
int main(){
    Date d1(1,1,1), d2(1,1,2), d3;
    d3 = d1-d2;
    // other code
}
```

And once again the compiler happily compiles our code to produce rubbish. It first converts `d1` and `d2` into `long`s, then does the subtraction, and then converts the answer back into a `Date` that it stores in `d3`.

Of course, you will never do anything so silly, but an excellent coding guideline says, 'write your code so that mistakes are discovered at the earliest possible time'. Qualifying your constructors as `explicit` and avoiding writing conversion operators increases your chances of catching idiocies.

### A book

When I was first offered a review copy of Michael Rosing's *Implementing elliptic curve cryptography* (ISBN 1884777694) I knew enough to expect a murky text out at the frontiers of cryptography. However, before I passed it on to a specialist reviewer I looked inside the covers. What I found pleasantly surprised me. Here is a book that explains a highly technical subject in a way that any good software developer with some understanding of C will be able to use. If you are looking for an alternative to PGP (particularly to embed in your product), I think you will benefit from studying this book. However, you will need to do some work as well as reading.

### A conference

By the time you read this, planning for the next joint venture between EXE and ACCU will be well under way. But for the moment just keep September 15-18 free and plan to be at the Oxford Union on those days. If you don't, you may well regret it.

### Last month's problem

Last month's problem was to consider what is wrong with the implementation of `main` in the following code.

```
#include <stdio.h>
#include <ctype.h>
struct char10 { char data[10]; };
typedef struct char10 mystring;
```

```
mystring uppercase(mystring item){
    int i;
    for (i=0; i<10; ++i) item.data[i] = toupper(item.data[i]);
    return item;
}
```

```
int main(){
    mystring hello = {"Hello"};
    printf("%s World", uppercase(hello).data);
    return 0;
};
```

If you look carefully at `uppercase`, you will note that it returns a `mystring` by value. If you are used to C++, this may not immediately stand out as being a potential problem. C programmers might be a little more suspicious, and this is C code.

The problem is with that `uppercase(hello).data`. Remember that this is exactly equivalent to `(&uppercase(hello))->data`. Of course, you may not be used to thinking of the equivalence that way round. However, when we write it that way the problem starts to surface; you cannot take the address of a value (a temporary in C++ terminology). To put it in a more conventional form: you cannot apply the dot operator in C to an rvalue. It was very simple in C: the dot operator had to have an lvalue as its left operand.

The rules have become much more confused in C++. For reasons that appealed to some (but caused more than a little concern among the UK technical experts), C++ decided to allow the dot operator to be applied to temporaries (rvalues). I am not going to rehash the whole argument here, but the upshot is that some invalid C code has become valid C++ code. In addition, C++ gives a meaning to a return of a `const` value.

For example, consider:

```
class myInt {
    // class details
};
myInt operator + (myInt & lhs, myInt & rhs);
This allows you to write such counter-intuitive code as:
int main (){
    myInt i = 3, j=4;
    i+j = i+j;
}
```

To prevent that silly assignment to the temporary returned by evaluating the left-hand `i+j`, you must replace the prototype for `operator +` with: `myInt const operator + (myInt & lhs, myInt & rhs);` Most C programmers (and many C++ programmers) will think that the `const` is unnecessary, but including it ensures that you can apply only read-only operations to the return value.

### This month's problem

Look at the following function that a student wrote to print out the letters of a word in reverse order. At first sight, the function is fine, but when the code was tested the computer appeared to lock up. Why?

```
void reverse_print ( char const * const word, size_t size){
    assert(size>0);
    for (; --size >= 0; ) putchar(word[size];
}
```

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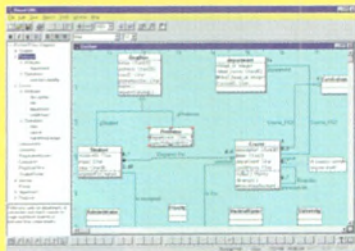


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# Let the user take control

By incorporating the Microsoft Script Control, Mark Smith demonstrates how you can make your Delphi applications extensible.



Over the past few years, interpreted programming languages such as VBScript, Perl, and JavaScript have received a lot of attention and many Windows programs are now programmable via Visual Basic for Applications (VBA). You may not have considered adding script-ability to your applications, but programs inevitably lack features that some users want. Allowing your application to be programmable can go a long way towards filling many, if not most, unanticipated requirements without the pain of doing a new release. This month I want to look at an easy way to add scripting to Delphi applications using the Microsoft Script Control. This control allows your user to run VBScript and JavaScript (or JScript as Microsoft prefers to call it) that interacts with your application and the objects it contains. As a developer, you can expose parts of your application to the script control, allowing the end user to use these parts as if they were global variables. This is similar to the way that VBA code within MS Office applications uses the automation objects that the Office applications expose.

## The script control type library

The Microsoft Script Control is a freely-distributable OCX control available from the MSDN web site, off the main scripting page at <http://msdn.microsoft.com/scripting/>. Once you have downloaded and run the installation file, you need to import the control into Delphi by importing the 'Microsoft Script control 1.0 (Version 1.0)' type library, which results in a single new component, TScriptControl in MS ScriptControl\_TLB.pas. Delphi does a good job of importing the script control, with one exception: it incorrectly imports the IScriptControl\_Error property, setting its read accessor method to be Get\_IScriptControl\_Error, which does not exist. The correct accessor is Get\_Error. Likewise, the property IScriptControl\_Error is incorrectly named, so I've changed it to Error.

There are two sets of documentation available for the script control. A help file msscript.hlp describes the control, while an HTML Help file vbscript5.chm describes the VBScript language and function library. Typically, you would include the HTML help file with your application's documentation.

## Using the script control

The script control TScriptControl exposes an IScriptControl interface, which is the useful bit. In the sample application for this month, I use a wrapper class TScriptService around the TScriptControl to provide additional functionality, more of which later.

The first thing you might want to do with a script control is run some scripts, and the sample application shows how to do this. First, build ScriptDemo, a simple MDI text-editor application capable of showing and editing several text files at once. Having built the application, select Tools, Script from the menu. When the script editor window appears, choose to open the demo.bas script file. This contains a few VBScript procedures that show the scripting control in action. Once you have loaded a script you need to 'compile' it by adding the code to the script control. Pressing the Compile button results in the contents of the memo control being converted into a string and passed to the script control via

its AddCode method. To run a script method you need to pick it from the list in the combo-box at the top of the screen and press the Run button. This results in a call to the script object's ExecuteStatement method.

The scripts in demo.bas illustrate a number of features of VBScript. The module contains three subroutines - Main, VersionAny, and GetVersion - together with the statement option explicit, which forces explicit declaration of all variables used in a script. Procedure Main uses the script control's built-in MsgBox function to display a message, namely the versions of Word and Excel, assuming that they are installed. It achieves this by calling procedure

```
option explicit
sub main
  msgBox GetVersion ("Excel.Application")
  msgBox GetVersion ("Word.Application")
end sub

sub VersionAny
dim p
p = InputBox ("What application?", "Application?")
  MsgBox GetVersion (p), , p
end sub

Function GetVersion (p1)
dim App
  Set App = CreateObject(p1)
  GetVersion = App.Name + " " + App.Version
  Set App = nothing
End Function
```

Listing 1 - Simple scripts.

```
IEEditApp = interface(IDispatch)
['{749CD43F-FFEE-11D2-B567-B3CC80E1F031}']
function Get_FileCount: Integer; safecall;
function NewFile: IEditFile; safecall;
function OpenFile(const FileName: WideString): IEditFile;
safecall;
function GetFile(Index: Integer): IEditFile; safecall;
property FileCount: Integer read Get_FileCount;
end;

IEEditAppDisp = dispinterface
['{749CD43F-FFEE-11D2-B567-B3CC80E1F031}']
property FileCount: Integer readonly dispid 1;
function NewFile: IEditFile; dispid 2;
function OpenFile(const FileName: WideString): IEditFile;
dispid 3;
end;

IEditFile = interface(IDispatch)
['{749CD443-FFEE-11D2-B567-B3CC80E1F031}']
function Get_LineCount: Integer; safecall;
function Get_FileName: WideString; safecall;
procedure Set_FileName(const Value: WideString); safecall;
procedure AddText(const Value: WideString); safecall;
procedure SaveAs(const FileName: WideString); safecall;
procedure Save; safecall;
procedure Close; safecall;
property LineCount: Integer read Get_LineCount;
property FileName: WideString read Get_FileName
write Set_FileName;
end;

IEditFileDisp = dispinterface
['{749CD443-FFEE-11D2-B567-B3CC80E1F031}']
property LineCount: Integer readonly dispid 1;
property FileName: WideString dispid 3;
procedure AddText(const Value: WideString); dispid 4;
procedure SaveAs(const FileName: WideString); dispid 5;
procedure Save; dispid 6;
procedure Close; dispid 7;
end;
```

Listing 2 - Interfaces for EditApp and EditFile.





GetVersion, which takes an application's automation name, launches the application via automation, and then grabs the name and version from it. Note that the call to MsgBox shows how to skip over parameters that you do not wish to provide values for. The procedure VersionAny gets input from the user using the built-in InputBox function and then passes it to GetVersion in the same way as Main does. Note that the variables are declared with the `dim` keyword (duh!), but have no type. This is because all variables within VBScript are Variants.

If a script has syntax or runtime errors, then you can query the script control's error interface, which holds the description, line number, and text at fault, among other properties. In the sample application, syntax errors are shown at the bottom of the screen along with the line number and the offending text. For runtime errors, the error text is blank, so we retrieve it directly from the memo containing the code instead. The script control has an `OnError` event, but I've had mixed results getting this event to trigger, so I use a `try...except` block to trap syntax and runtime errors.

### Automating the host application

Having seen the script control acting just like VBScript in any environment, we need to make it a value proposition for use in Delphi applications. The script control has a method `AddObject`, which takes an object name and a dispatch interface object, allowing the script programmer to refer to the object by the name given. If you need a short reminder of what dispatch interfaces are about, see *Dispatch interfaces*.

The sample application has two main form types: the main MDI parent, and many MDI children. To bridge the gap between the VCL world of Delphi and the COM world of the script control, we need to expose COM interfaces to these VCL form objects, and pass these interfaces to the script control using `AddObject` as described above.

To create the COM objects required, I used the ActiveX Automation object wizard to build two interfaces and objects that implement them. These interfaces, `IEditApp` and `IEditFile`, are defined in the application's type library and are shown in Listing 2. The first, `IEditApp`, is the starting point for scripting the application, and is more or less equivalent to the application's main form. Many of its methods (`NewFile`, `OpenFile`, and `GetFile`) return an object that implements `IEditFile`. This `IEditFile` is the interface to each of the file windows exposed by the application, and defines methods for modifying and saving files. Each form has a reference to an `IEditForm` interface that is used to control it, while each implementation of `IEditForm` in `EditForm.pas` maintains a pointer to the MDI child form instance that it is controlling. Using the Delphi type library editor to define your application's main classes and to write the skeleton of your application is a quick and effective way of programming, and I'm moving more and more of my coding to use this approach as time passes.

```
sub main
dim f
set f = EditApp.NewFile
f.AddText "Hello from the script engine"
msgbox f.LineCount
f.SaveAs "example.txt"
end sub

sub TimeStamp
dim i
dim f
for i = 0 to EditApp.FileCount-1
set f = EditApp.GetFile (i)
f.AddText (Now)
f.Save
next
end sub
```

Listing 3 – EditApp scripts.

## Dispatch interfaces

These days most COM programming makes use of well-defined interfaces to check the semantics of your application at compile-time. A dispatch interface is an ordinary COM interface that allows you to discover properties and methods at runtime. In the example application, the file `ScriptDemo_TLB.pas` contains several dispatch interfaces, notably `IEditApp` and `IEditFile`. Each of these interfaces is represented both as a normal interface declaration descending from `IDispatch` and as a `dispiinterface` (the dispatch interface itself), which lists each of the interface's properties and methods with an identifying number, called the Dispatch Identifier or `DISPID`. When you call a method on a `dispiinterface`, COM navigates through the dispatch interface to locate the property or method and then calls that method, passing in the parameters.

Dispatch interfaces can also be navigated by your application using the type library that is linked into your application. This is fairly tricky, and the demonstration application shows some code modified from the VCL `EnumDispatchProperties` procedure in `AxCtrls.pas`. Given a dispatch interface, `EnumDispatchAll` walks through the type library pulling out the properties and methods defined for that interface.

There are several things to remember when making your application support scripting. First, check you can treat your COM objects as regular automation servers within Delphi before you start suspecting that the script control is at fault. See the `Test` method of the main form for an example. I spent several hours trying to work out why the script control was not working, when the error was within my code all along. Second, put code you would normally put in the constructor into the `initialize` method instead – COM will not call your constructor. Also, be sure to include a call to `inherited` in your overridden `initialize` method. Remember that script variables are typeless, and do not allow the script programmer to use `QueryInterface` to get one interface from another. This means that you should only implement one interface on each object, unless you plan to add methods to allow the user to navigate between interfaces. For instance, interfaces `IA` and `IB` can both be supported on an object, but you will have to have `IA.GetB` and `IB.GetA` methods to allow the user to move from one interface to the other. Finally, try to avoid resetting your application while the script control is running – it usually refuses to halt, requiring a reboot.

### Unfinished business

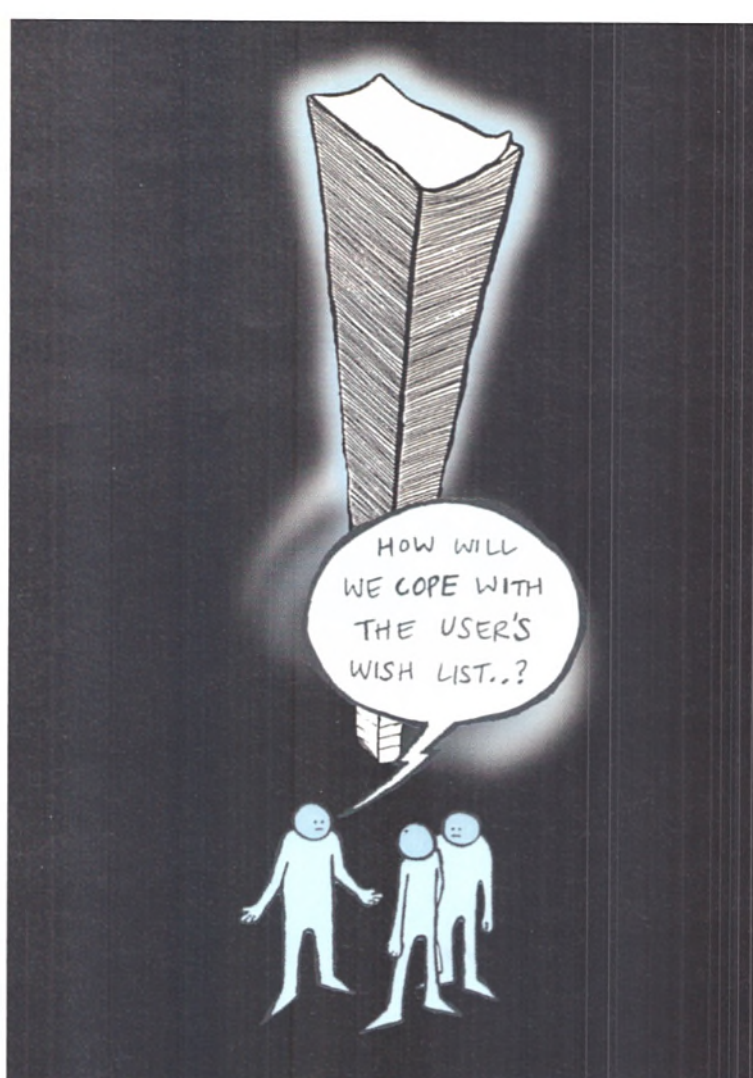
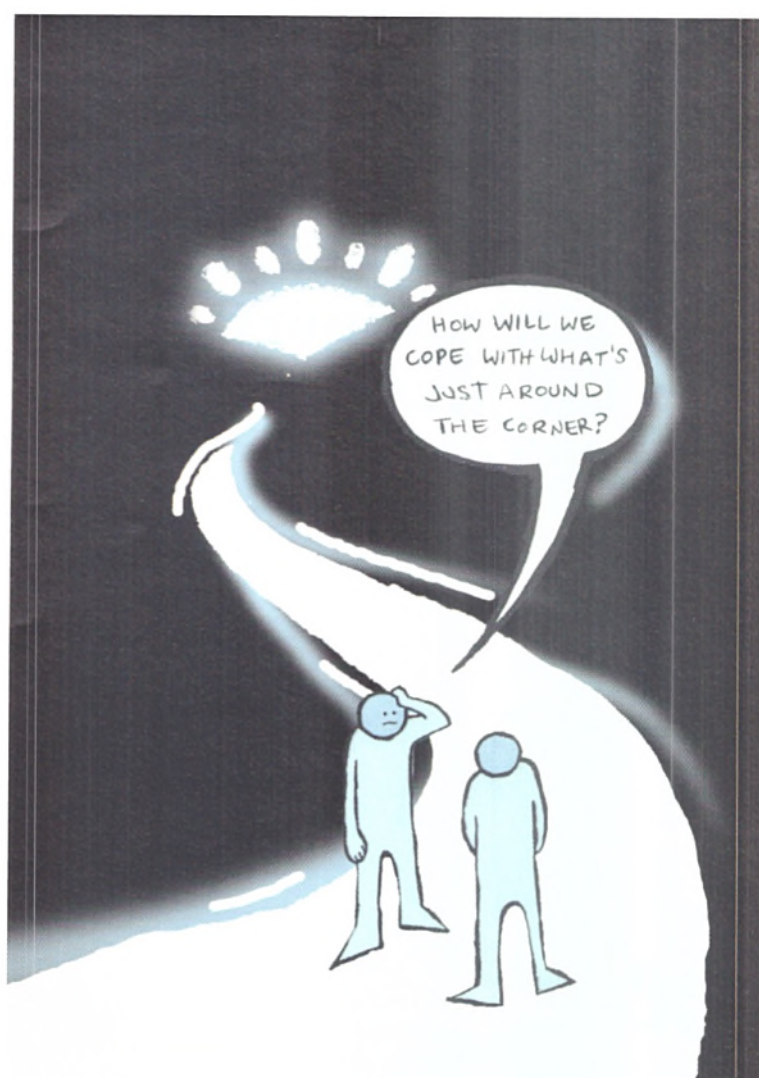
One unfinished feature of the demo application is a form for displaying the properties and methods of COM objects exposed to the scripting engine. The `ITypeInfo` interface allows you to explore a dispatch interface at runtime, and the application uses it to show a list of the properties and methods that a COM object exposes. The `ScriptService` object defined in the demo application keeps a reference to the `EditApp` object that is passed into the script control, since it is not possible to query the script control to find out what objects it contains. Expect more information on investigating `ITypeInfo` very soon. ■

*Mark Smith is a Delphi contractor, currently working for an investment company based in Westminster. You can contact him by emailing [msmitha@cix.co.uk](mailto:msmitha@cix.co.uk), or say hello at a Borland User's Group meeting. Telephone 01980 630032 for BUG details.*

EXE  
ONLINE

The code for this article is available on EXE OnLine and via ftp at [ftp://ftp.exe.co.uk/pub/exestuff/9906\\_delphi](ftp://ftp.exe.co.uk/pub/exestuff/9906_delphi).





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# JESS'99



Sun recently organised a major European event solely on Java.

David Mery recounts the high points.

If Sun is to be believed, over 6000 people attended the third annual Java Enterprise Solutions Symposium (JESS), which this year was held in Paris. This is up from the 4000 who attended last year's event in Berlin. A high proportion of the attendees were developers (during his keynote, John Gage – Chief Researcher and Director of the Science Office at Sun – asked for the programmers among the audience to stand up, and approximately two-thirds rose). Even if the numbers banded about are a bit optimistic, the conference reflected strong interest in Java around Europe (even in the supermarkets – see picture).

Sun claims that there are about one million Java developers worldwide. One problem with this statement is that it includes everyone who ever wrote a 'Hello world' applet as well as those who developed the actual applications in use today. Daryl Plummer (VP & Research Director – Applications Development Tools at Gartner Group) attempted to give more precise figures for 1998-1999: 500 to 600,000 casual applet developers, 250 to 300,000 serious Java developers, and less than 50,000 certified professional Java developers. Certification can be through college courses, seminars, or just by being self-taught. If you can pass the test, you're in. See [java.sun.com/cert-initiative](http://java.sun.com/cert-initiative) for more details on the initiative backed by IBM and Oracle. Plummer advises developers to 'focus on the Java platform, rather than the language, for network-oriented applications and services'.

As part of its Developer Connection programme, Sun announced JavaTutor, a Java Programming Language course on a triple set of CD-ROMs (Java programming language, Java GUI and applet fundamentals, and Beyond basic Java programming). New seminars covering programming distributed services with Jini technology and Enterprise JavaBeans have been added. Also, the certification programme for Java has been updated to cover the Java 2 JDK. Some Sun Education Essentials courses are exclusive to members of the Sun Developer Connection programme. More information is available at [www.sun.com/service/suned](http://www.sun.com/service/suned), [java.sun.com/developers](http://java.sun.com/developers), and [www.sun.com/developers](http://www.sun.com/developers).

## Father of Java

James Gosling, VP & Sun Fellow, Java Software – better known as the father of Java – finds that in retrospect, 'Java does pretty much what I expected (from a technical point of view)'. Furthermore, this is the year when the 'performance problem goes away': v1.0 was optimised for portability, v1.1 pushed CPU performance, and v1.2 sees the introduction of HotSpot (see below). Design goals were to 'stick to things that were very clean and worked. I was careful not to do language research myself but pick out the ideas that worked'. One common criticism of Java, especially compared to C++, is that it restricts the programmer's freedom. Gosling states that the language was not intended to stop you shooting yourself in the foot, that 'it's more about protecting others from you'. It becomes important to protect users and other developers from common mistakes. One typical example he gives is garbage collection as the only way to manage memory. While some developers hate

garbage collection, it is still the case that a significant proportion of bugs are introduced by memory allocation problems.

When asked about changes to the language, Gosling adopts a conservative, prudent attitude. He stresses that it needs to be done in a 'careful' way and 'involve the community'. However, he agrees that polymorphic types would be useful. At the time Java was designed, it was unclear which way to go to implement polymorphic types. Today he considers Generic Java (GJ) to be one of the best approaches ([www.cd.bell-labs.com/who/wadler/pizza/gj/](http://www.cd.bell-labs.com/who/wadler/pizza/gj/)). GJ is an extension of Java that supports generic types, it is a superset of the language and compiles into JVM bytecode. As for operator overloading, Gosling considers it 'an interesting one: when you talk to people using C++, you've got really emotional responses. It's really easy to misuse.' Gosling is not keen on adding anything that has too much scope for misuse. (Both the lack of templates and overloading were issues Bjarne Stroustrup raised in an interview for EXE, which can be found in the March 1998 issue.)

During a question and answer session, Gosling talked about several Java issues. On the lack of `const` parameter declaration (not quite the same as `final`): 'people think that when you declare something `const` it is a constant. The problem with `const` in C++ is that it is essentially a comment. There's a proposal for immutable objects.' On memory leaks in JDK 1.2 Swing: 'Swing does not leak, Swing hangs on to many things.' (Apparently, there's work going on to improve performance and memory consumption.) On future implementation of multiple inheritance: 'Sure, use interfaces!' On inner classes: 'I like inner classes a lot, I tried to put something like that in Java about six years ago, but then the users complained.' And on Java's evolution: 'the two top priorities are a Linux version, and assertions (à la Eiffel). Assertions were there in an early version but were ripped off because of debates on how to do it.'

These days, Gosling doesn't have any real control over Java. He's 'central in a different way'. He spends lots of time talking to developers and speaking around the world. Otherwise he spends his time hacking with no real deadlines... and as can be expected he develops mostly in Java. He sometimes writes 'little parsers for little languages'. Some of his pet projects include working on visual languages/interfaces, for example creating a user interface for specifying beans properties and a declarative scripting language.

From a developer's point of view Java should really be considered as a platform. The API specifications define an interface, underneath which are many interchangeable implementations. A roadmap given at the conference showed Sun's plans for maintenance releases in the second quarter of 2000 and 2001, upgrade releases in the fourth quarter of 1999 and 2000, and for the next feature release in the fourth quarter of 2001.

## HotSpot

According to Alan Baratz (President, Java Software): 'HotSpot is the only technology which will bring performance similar to binary'. HotSpot is Sun's next generation JVM – the first release plugs into the classic Java 2 VM. Baratz confirmed that 'Java needed to be rewritten to take advan-







tage of HotSpot technology' and this has been done in Java 2. Meanwhile, Lars Bak (Engineering Manager & Technical Lead at Sun) revealed the mechanisms behind the HotSpot Performance Engine which was formally released at JESS (binaries for

Windows and Solaris are available at [java.sun.com/products/hotspot](http://java.sun.com/products/hotspot)).

HotSpot provides adaptive compilation, efficient memory management, fast synchronisation, and fast threading. SPECjvm98 on a twin-processor Windows NT machine gave a ratio of 31.1 compared to 16.4 for classic Java 2 SDK with Symantec's v3.00 JIT. VolanoMark benchmarking on Solaris shows that performance degrades much more gracefully (compared to Java 2) when the number of connections increases. Interestingly, HotSpot fares slightly worse for the first few hundred connections when it's analysing what to optimise.

Just-in-Time compilation brings performance improvements to pure interpreted JVMs, but consumes execution time, hence the trade-off between good code and fast compiler. Also, compiled code takes up memory (up to four or five times more). HotSpot addresses these issues. The adaptive compilation allows for mixed mode execution by compiling only hotspots. For this the program needs to run before being partly compiled: HotSpot effectively 'predicts the future by looking at the past'. It performs aggressive inlining and allows for backing out to interpreted mode if it has inlined some code where dependence later occurs. It compiles fewer methods, spreads out compilation pauses (typical GC pauses are less than 10 ms), and preserves memory. Since HotSpot knows where all the pointers are, it supports exact garbage collection and object migration. GC performance is also improved by a generational GC mechanism and rapid allocation of memory for new objects. When garbage collecting, HotSpot only ever needs to stop threads executing bytecode – threads running native code can continue to run.

Future work on HotSpot will focus on improved performance (more aggressive optimisations, better local code quality, and better scalability) and on directly debugging optimised code without the need to back out to interpreted form.

### Simple Jini

Bill Joy, Chief Scientist at Sun, expects the first products to implement Jini – the network 'plug-and-work' architecture and services to allow spontaneous networking – towards the end of the year. Jini will appear first in printers and cameras. The most exciting Jini products will be phone handsets but the first of these won't arrive until next year. The cycle will be even longer for hi-fi and white goods such as fridges.

The first Jini service is JavaSpaces which Gosling describes as 'interesting to build software that moves around'. It's a simple service for cooperative computing, aimed at protocols that are modelled as an exchange of objects. Ken Arnold, Senior Staff Engineer, insists on the simplicity aspect of it. Sun looked for the minimum architecture needed to implement it: JavaSpaces entries are lookup service entries and the architecture is based on transactions, leases and events. That's all there is to it. It's based on an object repository that has persistence, template matching lookup and transactions. The entries are distributed (RMI-based) and concurrent. Even if JavaSpaces might look similar to a relational or an object-oriented database, Arnold insists that it is not an attempt at either of these.

To support transactions, scalability and replication, only four operations are needed. *Write*: putting an entry into the space. *Read*: returning a matching entry from the space. *Take*: removing a matching entry from the space. And *Notify*: sending an event if a matching entry is written. The protocols are loosely coupled, ie a writer doesn't know who will read or take. The *entries* mentioned above are objects that implement

Entry. These have three restrictions: all fields must be public, fields may be of any kind of object, and they must have a public constructor with no argument. They are added to a space using *Write*. The only other detail not yet mentioned is the matching process. Matching requires a template entry in which each field is either a value to be matched exactly or a wildcard meaning 'I don't care'. The space is searched for any entry that is at least the template's type and has all matching values.

The loose coupling of the protocols allows for easy scalability. Examples of use given include workflow (in an accounting tracking system), groupware/version control (associating an entry for each version of a JavaBean), trading systems etc. An evaluation copy can be downloaded at [developer.java.sun.com/developer/products/jini](http://developer.java.sun.com/developer/products/jini).

### Standardisation process

On May 6, Sun announced that it had submitted v1.2.2 of the Java 2 Standard Edition (J2SE) to ECMA (European Association for Standardising Information and Communication Systems) for standardisation. J2SE comprises the Java Language, the JVM and the Java 2 Platform API specifications. Currently the Java specifications go through Sun's Java Community Process (JCP), which allows for external comments. Sun claims that 'ECMA is a Class A ISO liaison, and this unique relationship allows ECMA standards to be forwarded to ISO for adoption as international standards'. This is not entirely convincing as Sun was previously working directly with the ISO JTC-1 as a PAS submitter. The main issue seems to centre on who is in charge of the maintenance of the standard. Also why make this announcement one week after a major Java event when allegedly the procedure started in April?

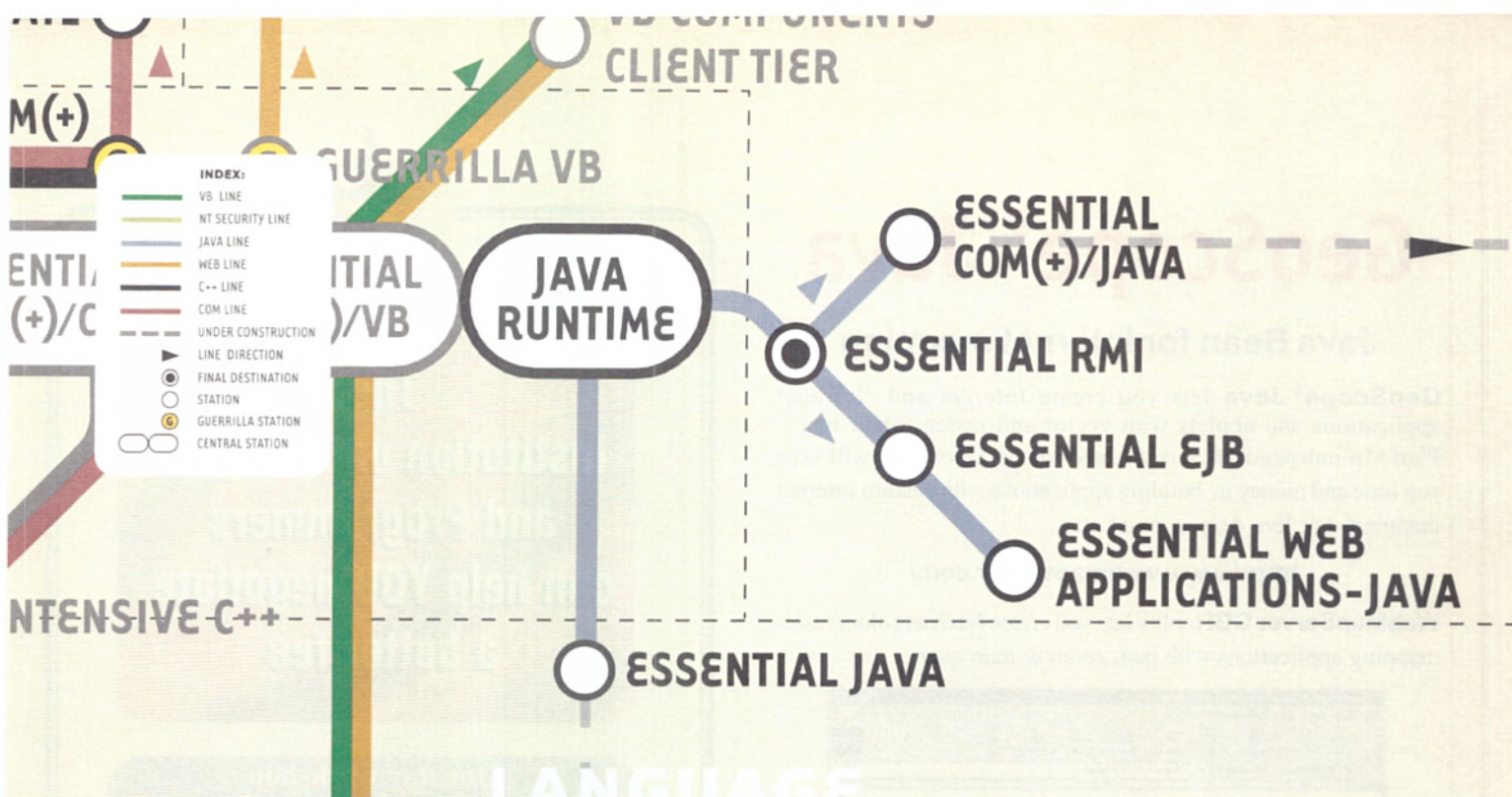
During JESS, Daryl Plummer (from the Gartner Group) stated that 'Java fragmentation has forestalled; this was something that had concerned us. Microsoft has been losing ground in controlling Java, you could even say that Microsoft has lost the war'. Ed Zander (COO and CEO, Sun) used strong words towards diverging efforts: 'I'll be very blunt; I think Microsoft and HP, the things they do to Java technology are to prevent the Java platform from taking off. Java technology is not Sun any more; IBM has got more developers in Java technology than Sun will ever have. A lot of the APIs in Sun's Java technology are being developed by other companies.' Microsoft and HP are among companies that reacted by launching the J Consortium (an outgrowth of the Real-Time Java Working Group), an industry consortium working on open standards relating to real-time and embedded Java technologies. Sun works with IBM on real-time Java within the JCP. Baratz furthered Zander's point: 'it's a last, desperate attempt to try to revive what's going on with Chai, or maybe to derail true standardisation of Java technology'.

Even if one million Java developers is not quite the reality and there are still some attempts at offering a different view of Java than Sun's own, the technology looks strong and the interest in it too. Business applications written in Java have been deployed. Forget the hype and take a look at the reality.

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| JavaBeans (JBJ) downloads         | 363,096                 |
| Java licensees                    | 195                     |
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| Jini SCSL downloads               | 11,000                  |
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Table 1 – Growth of Java developer community (as of April 1999, Sun)





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### Java Time Table hands-on courses underground

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| <b>Essential Java</b><br>for developers                   |                   | 19/07-23/07 | England             |
|   |                   |             | Southern California |
|   |                   |             | Boston              |
|   |                   |             | Portland            |
| <b>Intensive Java</b><br>the runtime environment          |                   | 19/07-23/07 | England             |
|   |                   |             | Southern California |
|   | 07/06-11/06       |             | Boston              |
|   |                   |             | Portland            |
| <b>Essential RMI</b><br>Java distributed objects          | OFFERED IN AUGUST |             | England             |
|   |                   |             | Southern California |
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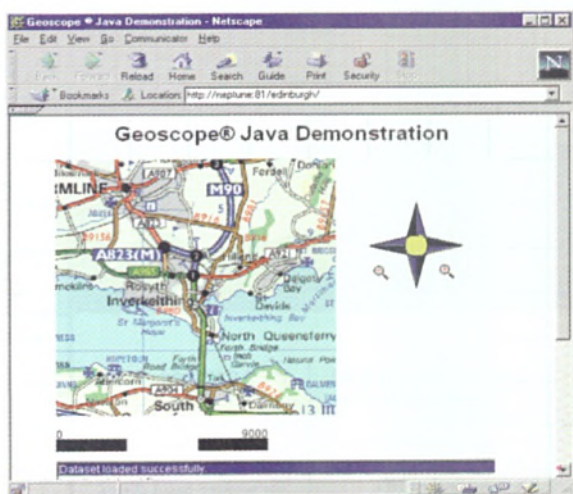
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# Back to school for WebClasses

Visual Basic 6.0 introduced new methods for writing server-side Internet components. Jon Perkins reports...



This month I'm taking a look at the new WebClass technology. Before I start I'd like to make an apology to a certain subset of readers who might regard the contents of this month's column as being rather fundamental. However, I do know that the great majority of Visual Basic developers are still focused solely on conventional Windows application development. Many such folk are interested in Internet development issues – if only for the sake of their CVs – but have yet to get started. Therefore, for the next couple of months I'll be taking a look at what WebClasses actually are, and of necessity we'll be having a look at Microsoft Internet Information Server (IIS). While I can provide the very basic elements with which to get up and running, further reading will be essential to make any headway with this topic. Initially, I'm working on the fairly safe assumption that the reader will be familiar with using a web browser. I also need to show some lightweight HTML.

What are WebClasses, and why do we need them? In a sentence: they are ActiveX DLLs that run on a web server. However, to understand them we can start by taking a look at the simple Internet model. The act of browsing an Internet page involves being sent a stream of HTML from a website. Each web page is stored on the server as a separate HTML file, produced either by hand or by a generator such as Microsoft FrontPage. An HTML page is a set of formatting instructions very similar to the more familiar Rich Text Format (RTF). Although HTML itself doesn't support any programming constructs such as `If...Else...EndIf`, the typical web browser does support embedded scripts through a `<SCRIPT>` tag. The most common of these client-side script languages are VBScript and JavaScript (JavaScript is a language defined by Netscape Communications, and Internet Explorer supports a Microsoft version of this called JScript).

This method of sending raw script down the wire is fine as far as it goes, but drawbacks start becoming apparent as a website becomes more ambitious. For example, all of your business logic must be sent to the user as clear text. Apart from giving away information that you would rather keep to yourself, this can have an impact upon performance. Potentially large scripts might need to be downloaded and run simply in order to get a line of text as an answer to a user query. This problem is further compounded by database access requirements.

## The ASP object model

WebClasses are designed to produce web applications that can be run from any browser because all of the processing code is run at the server end. To make this work the server-side of the operation must support the Active Server Page (ASP) programming model. In a production-level model this equates to Internet Information Server running under Windows NT Server. However, for development purposes this can also mean either the Peer Web Services if you're running Windows NT Workstation (found on the Windows NT Option Pack CD), or the Personal Web Server for Windows 9x.

IIS exposes the Internet Server API (ISAPI). This is a standard means of access for a web developer to produce code that interacts

directly with the server service. However, being an API means that it is more tailored for C++ programmers. Therefore, Microsoft has designed the ASP model as an extension to the ISAPI feature set, which offers a scripting environment designed to accommodate server-side execution. This model is further extended because Visual Basic 6.0 provides a programming interface that mirrors it.

To understand the nature of the object model it is necessary to review the basic process flow that occurs when downloading an Internet page: once a browser has established an initial TCP/IP connection to a server it then sends a request message. This two-stage action normally comes about through an event such as clicking a hyperlink or supplying an address in the navigation bar. The server then generates a response and passes it back to the caller. This process is mapped into Visual Basic programming terms through the provision of a Request object and a Response object. These objects are predefined and are globally available within the DLL, similar to the globally available Forms collection within a conventional VB application.

The Request object contains several collections of information that the server will need to know about, the most important of which is the QueryString collection. This holds any specific pieces of data that the web page has passed up along with the request, such as any data that the user has supplied (for example, a search string). Another of these collections is called ServerVariables, which stores data of a more environmental nature, such as the screen resolution of the browser.

The Response object is concerned with sending data back to the browser. This return data can either be written directly to the caller

```
<html>
<head>
<h1>EXE Subscriptions Department</h1>
<p>Thank you for visiting our site.</p>
</body>
</html>
```

Listing 1 – Contents of Thankyou.htm.

```
<%
Response.Buffer=True
Response.Expires=0

If (VarType(Application( _
    "-WC-WebClassManager")) = 0) Then
    Application.Lock
    If (VarType(Application( _
        "-WC-WebClassManager")) = 0) Then
        Set Application("-WC-WebClassManager") = _
            Server.CreateObject( _
                "WebClassRuntime.WebClassManager")
    End If
    Application.Unlock
End If

Application("-WC-WebClassManager").ProcessNoStateWeb
Class "Project1.WebClass1", Server, Application, _
    Session, Request, Response
%>
```

Listing 2 – Contents of WebClass1.asp.





via the `Write` method or it can be gathered together into a buffer and sent later via a call of the `Flush` method.

Using either of these methods can result in a full web page being created on the fly, for example:

With Response

```
.Write "<html><body>"
.Write "Please call again..."
.Write "</body></html>"
```

End With

Alternatively, the object contains a `Redirect` method that points the browser to a different location than was originally requested.

In addition to these two objects, another three complete the family. There is the Application object, of which a single instance exists during the lifetime of the web server. There is the Session object, which exists for the time that each user is connected to a site provided by the web server. Together with the Application object this is useful for storing state information (I shall be providing greater coverage of this topic in next month's column). And finally, there is the Server object, which provides the ability to create ActiveX object instances.

## Creating a new application

WebClass development is different to conventional application development in that you do not have a form painter. When you are defining the individual components of a WebClass – called WebItems – you need to have an HTML template already defined. However you go about this depends upon what you feel the most comfortable with. If you are really new at web development but you are keen to roll your sleeves up, then you can buy yourself an HTML manual and type the code in via a Notepad session. However, while you're busy figuring out what the `<OL>` tag stands for, the rest of us will probably want to use something like FrontPage or Visual InterDev to construct our web pages. The Advanced tab of the Tools, Options menu allows your choice of the web page editor to be set, which by default is Notepad.

This approach to importing existing HTML files can lead to a much more clearly defined division of labour. With conventional Windows application development the form design is often performed by the same person that writes the underlying code (ignoring any concepts of tiered development for the sake of this discussion). In the case of a WebClass project, the actual template could be constructed by a specialist in graphics design, leaving the coding-side of the operation to a software developer. At least, that's how Microsoft sells it. In the real world, developers often prefer to work on their own creations from start to finish.

When you load up a new Visual Basic session you need to choose the IIS Application project type. Once the environment has duly created itself, you will find that you have a Designers folder within the project window with a default `WebClass1` entry already assigned. At this stage it's worth having a quick look in the Project, References dialog to see what additional files have been pulled in. The Microsoft WebClass Library v1.0, `mswcrun.dll`, is the redistributable file that maps the Visual Basic calls into the ASP environment. The other new reference, the Microsoft Active Server Pages Object Library, or `asp.dll` for short, is the destination for all browser requests for targets that have an `asp` extension.

Having created the project, you need to save it before you can do anything with it. I would suggest that you save your project to a local drive because you can immediately find yourself getting dialogs asking for passwords for shared network resources. In the early stages this could be quite intimidating and could easily result in your not looking

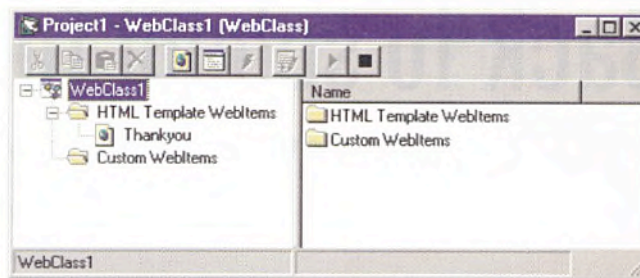


Figure 1 - The WebClass designer with newly added WebItem.

at Internet development for another 18 months. You can import a template into the project, via the Add HTML Template WebItem button on the toolbar. I have created a very simple HTML file called `Thankyou.htm`, the contents of which are shown in Listing 1. When you import a template file into your project the WebClass designer actually makes a copy of it and uses this instead: my source file of `Thankyou.htm` also exists as `Thankyou1.htm`. In my example I renamed the default WebItem name of `Templatel` to `Thankyou` for consistency with the intended functionality of the form. See Figure 1.

Double clicking the `WebClass1` entry in the left-hand pane of the WebClass designer brings up the associated code window. It can be seen that code for a basic response has been generated by default. In order to startup with a web page of our own we can replace the whole text as follows:

```
Private Sub WebClass_Start()
    Set NextItem = Thankyou
End Sub
```

The purpose of the `NextItem` property is to shift the context to a different WebItem. In order to cause the WebClass to actually process the template and pass the contents out to the browser it is necessary to call the `WriteTemplate` method for the `Thankyou` WebItem's `Respond` event:

```
Private Sub Thankyou_Respond()
    Thankyou.WriteTemplate
End Sub
```

From the outset it should be possible to compile the project into a DLL. Looking at the contents of the project directory reveals that another file has been created, in this case called `webclass1.asp` because I've not renamed it. The contents of this file can be seen in Listing 2. This is the code that is fired first when the server is accessed. After initialising a new instance of the WebClass runtime environment, it then sets the Application context to `Project1.WebClass1`. Once the DLL has been properly installed onto a production server, all of these details will of course have been added to the registry so that the `Project1.dll` file will be called to provide the `WebClass1` code. This sequence shows that an ASP file exists in a one-to-one relationship with a WebClass.

## There's more WebClass coverage

What I've covered are the very basics of WebClasses. For some Visual Basic developers there are new concepts to come to terms with, but much of it is broadly similar to existing principles. Having made a start with this subject, I'll continue WebClass coverage next month by taking a look at some of the development issues in more detail. ■

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





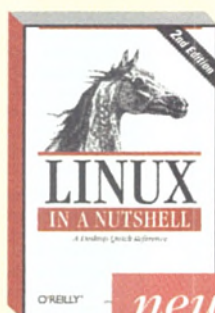
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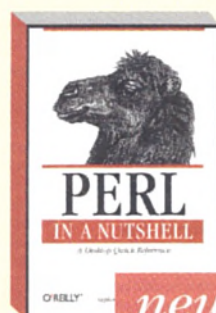
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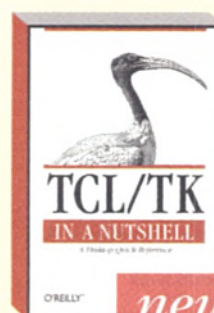
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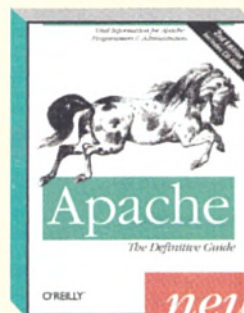
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| Team Programming using VisualAge for Java                                | Regularly | 2    | 650  | Southampton | OBJE    | The Win32 API – Fundamentals of Creating Great Windows GUI Applications | Call      | 5    | £1200 | Call  | SYNX    |
| Building TOPLink Enabled Java Applications                               | Regularly | 3    | 1150 | Southampton | OBJE    | The Win32 API – Advanced Techniques in Writing Windows GUI Applications | Call      | 5    | £1200 | Call  | SYNX    |
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## PROGRAMMING

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| Delphi Professional Fundamentals                        | Monthly   | 5 | 1280 | Bristol | BRKS  |
| Delphi Professional Fundamentals                        | Monthly   | 5 | 1280 | London  | BRKS  |
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| Delphi Database Development                             | Regularly | 5 | 1280 | London  | BRKS  |
| Delphi Web Application Development                      | Regularly | 5 | 1280 | Bristol | BRKS  |
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| ActiveX with Visual Basic                               | Regularly | 1 | 300  | On-Site | Clip  |
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|--|-----------|------|------|-------|---------|-----------------|
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| Supporting Microsoft SNA Server V4                         | Regularly | 5    | POA  | Call  | QA TR   |                 |
| Windows NT 4.x Essentials                                  | Regularly | 4    | POA  | Call  | QA TR   |                 |
| Windows NT 5 Essentials                                    | Regularly | 5    | POA  | Call  | QA TR   |                 |
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|                                |           |   |     |      |       |
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The Windows API Developer Training Specialists

Kim Crouse-Wilson is Technical Director of Synaptix Inc (USA), probably the most expert Windows API training company in the world. Kim was formerly Microsoft's Senior Trainer and knows the Microsoft Win32 SDK backwards (especially the undocumented stuff!). She is available in the UK from July to September to improve your fundamental or advanced Win32 API programming. It's for all 'C' programmers, and also for C++ programmers who need better GUI than MFC can offer. Kim's latest GUI creation is MicroProse Inc's 300,000-selling game, 'Magic: The Gathering'. Try this GUI for yourself! Find out why Microsoft, Intel, Hewlett-Packard, IBM, Novell, Nintendo, Motorola, 3M, Lotus etc all used Kim. Training at our place or yours. For a real boost to your talent, this is a unique opportunity.

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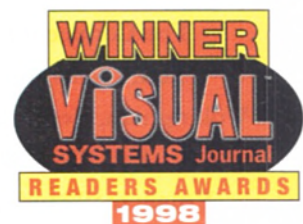


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# Diary of a closet Linux user

**Monday 10 May:** Today is the day. I don't care what everyone else says. I'm going to install Linux. Went down to a Well Known High Street Software Shop, asked for Red Hat 5.2. They pointed me to TopMan. Mental note: TopMan does not sell software. Did get a nice red hat, though.

**Wednesday 12 May:** Success! Found Red Hat 5.2 on the cover disc of *Personal PC Today*. Also has a demo of Quake 3 (but not for Linux). Think I'll put off the install for a few days while I play it.

**Tuesday 25 May:** Bugger. Perhaps I should have read the installation notes before I used fdisk. Now I'll have to reinstall Quake. Oh well. Install of Linux surprisingly easy. Not too impressed with the GUI, though. I mean, it's all so *purple*. Des the Linux guru at work says I should download Gnome. Mike the other Linux guru says I should download KDE. Des and Mike had a fist fight. Des won.

**Thursday 27 May:** Tried Gnome. Took a while, but I finally made it look just like Windows. Feel much happier now. Think I might try recompiling my kernel, make myself a genuine member of the Linux inner circle.

**Friday 28 May:** Everything works fine after complete re-install. Mental note: read man pages before recompiling kernel next time. Am now the proud owner of a complete Linux-only system. I feel much more *open* already.

**Sunday 30 May:** Just remembered I have to finish that report for Accounts before tomorrow. Tried opening it in Emacs but I don't know any of the commands and all the formatting codes came out like gibberish. Called Mike the other Linux guru at home. He said I needed to install 'tech'. Got very confused. Asked what I could get that would read Word files. He hung up on me.

**Monday 31 May:** Up all night last night, reinstalling Windows and Office. Never realised it was such hard work. Did my report. Reinstalled Quake. Have decided to sacrifice my principles and stick with Windows. Des and Mike won't talk to me anymore. Ah well. Mental note: see if TopMan will take back that red hat.

*Next month – the Diary of a closet Windows 2000 Professional Beta 3 user.*

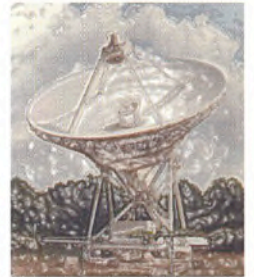
## Greetings, Earthling

The real problem with looking for extraterrestrial radio signals is that it's indescribably boring. You could have more fun listening to the Chris Evans Breakfast Show all day than getting 8 hours of meaningless static punctuated by the odd pulsar or two. This, and the fact that crunching all that data requires computers so high up on the Honeyball Index that Michael Dell sells them personally, probably explains why so few people are actually doing it.

But now you, the humble computer user, can play your part in the effort to pick up Radio Betelgeuse, thanks to Seti@Home, a project being run from the University of Berkeley in California. Collected data from many radio telescopes is parcelled up into small packets and placed on a server, where it is picked up by the Seti@Home software on your PC or Mac – which runs as a

screensaver. The program crunches its little bit of data in the machine's idle time and returns the results to SETI for inclusion in the great whole. This saves the hard-up researchers the price of a few super-servers and leaves them enough for a jolly good party – to which you will, of course, be invited – when the long-awaited signs of extraterrestrial intelligence are finally found.

So, if you fancy achieving international fame and fortune by being the one whose computer actually discovers ET, or at least elevating yourself to a higher plane of geekdom, surf on over to <http://setiathome.ssl.berkeley.edu> to sign up.



## Its bark is worse than its byte

Well, it had to happen. Those devilish Japanese always take European innovation and turn out bigger and better versions (well, that's what my Dad said, so it must be true). So it is with Aibo, the latest gizmo from those awfully nice Sony people. It is, quite simply, Furby on steroids.

Aibo (it means 'mate' in Japanese) is a robotic dog which makes up for not being as furry as Furby by being infinitely more intelligent. Pat Aibo gently on the head, and it recognises your praise and reacts accordingly. Slap it sharply on the head, however, and it goes into a sulk at your reprimand. The little creature can do tricks even dogs can't do, such as catching a ball in its paws, thanks to a highly-discriminating 180-odd thousand colour CCD camera in its nose which enables it to see a variety of fast-moving objects. Aibo can also talk and sing in English and Japanese – but not Furbish – and will even roll over to have its plastic tummy tickled. A wide variety of sensors detect light, heat, motion, and noise.

At the moment, commands have to be given via the supplied remote control, but Sony is working on voice control. One thing the dog won't do, however, is die. Sony apparently debated putting in a mortality function but decided against it. Aibo is not a snip at a shade over £1,500, and is being sold

(over the Internet only) in very limited numbers in Japan and the USA. The other big problem is that it only lasts for about 1½ hours before needing a recharge.

Those who enjoyed our recent article on programmable Lego (*Legoware*, EXE, April 1999) will be pleased to hear that there is an SDK for Aibo – although it's an expensive extra. We'd love to give one away but let's face it, even if Sony were prepared to give us one – which they're not – it would never leave the office. Or my desk. Not even for walkies.

Find out more at <http://www.world.sony.com/robot/index.html>.



### Oops

Finally, a quick appeal to Jason Judge of Whitley Bay, who – you may recall – scooped the brilliant second prize Intel Pentium II Bunny Person Doll in our Great Yellow Hat competition. Jason – can you please send us your postal address again. Because we've lost it. That's how dumb we are (*speak for yourself – Ed*).



# They made one small mistake...

**Fancy yourself as a Sherlock? Keep those little grey cells in tiptop condition by matching wits with Verity Stob.**

## The Darrington Coal Truck virus

It seemed like just another ordinary Thursday morning in Accounts, until Jayne Thornton, equipped with a large pile of quite plausible receipts and claim forms, connected to the server and opened up the *Travel Expenses 99.xls* spreadsheet. Then she knew at once that something was wrong. For instead of the normal rows of flights to Edinburgh and car hire at Charles de Gaulle, there was a large dialog:

Deadly Excel Macro Virus.  
Today is the 23<sup>rd</sup> anniversary of the Darrington Coal  
Truck Near Miss

So wave bye-bye to your hard disk, Jayne.  
Press Ok to continue.

Jayne gave out a little scream and Rod, who had been watching, picked up the phone and dialled. Seconds later\* Verity Stob burst through the door. 'This is Tech support! What's the problem?'

The accountress tearfully indicated her screen.

'Hmmm. It looks rather like a macro virus. Can you show me your hands please?'

Jayne looked up in surprise. 'What?'

'Some computer viruses are passed by manual contact. I'm going to need to run *Dr Solly for People V3* on you. Can you hold out your hands please?'

The Accounts department gasped in amazement. Had Verity finally lost her grip? Jayne reluctantly put out her hands... and with a deft movement, Verity snapped on a pair of handcuffs.

'Okay Thornton, the game is up. That's no virus, that's a rather tiresome joke program devised by your VBA-knowledgeable and alliterative boyfriend Ian from Invoicing. You are under arrest for deliberately wasting tech support's time.'

*How did Verity Stob know it wasn't a virus?*

The dialog called her 'Jayne', whereas everybody in the office always called her 'Planky', for reasons that we had better not discuss here. Everybody, that is, except Ian from Invoicing – and even he is only going out with her so he can use her car, or that's what I heard anyway.

And for another thing, it's only the 16<sup>th</sup> anniversary of the Darrington Coal Truck Near Miss. A real virus writer wouldn't make a silly mistake like that.

*\*About 1800 seconds later, since you ask.*

## Clipper justice

'Come over here a minute, Verity. Meet Kenny – he's our new Clipper programmer, and he's from Morpeth.'

'Hi Kenny, good to see the old DOS skills are still being kept alive. On the job already I see. What are you up to there?'

'Well I'm just tuning your old address database program. It's difficult to read under Windows so I've put in this line

```
SET COLOR TO User_Col
```

and then aaaaaaargh! You're breaking my arm!' Verity Stob had

darted forward, and now held Kenny in a deadly quadruple-nelson grip. Her manager intervened. 'Verity! What on earth are you doing?'

'I don't know why, but this man is telling us lies about his identity. Aren't you?'

'It's true! It's true! Get off!' sobbed the wretched culprit. 'I'm actually a Fox Plus hacker from Birmingham, Alabama. I learned to imitate the North Eastern accent by watching taped interviews with Kevin Keegan. I came here with a mission to infiltrate your fine Clipper code with inferior, poorly-scoped early xBase-style programming.'

'Phew, that was a close shave!' said the manager. 'Take him away, boys, and give him a taste of British Clipper justice.'

*How did Verity detect the impostor?*

Unlike inferior xBase dialects such as FoxPro 2.6 and 3 and also dBase III, Clipper allows you to write `SET COLOUR TO` instead of `SET COLOR TO`. (This is really true, by the way.) A real programmer from Morpeth would never contemplate using the American English spelling.

## Ping

'Blimey Tim O'Reilly!' said Royston Boss-Figure as he perused the invoice for the ISDN line. 'It's over £500 – and just for this quarter!'

'Hmmm,' said Verity Stob, looking over his shoulder. 'And a lot of the calls seem to happen around 8am. We could have a look at the router's log.' She sat down at a terminal, telnetted into the router, and in a few seconds was poring over a list of call-triggering TCP packets.

'There's your problem! Protocol 1 – that's a Ping packet – on the dot at 8 o'clock! That must come from the server – nothing else can do pings because of the way the firewall and the proxies are set up. I wonder if someone has accidentally left some sort of test program scheduled that brings up the line every day – and so causes our ISDN bill to be inflated?'

*How was Verity able to reach this correct diagnosis so quickly?*

She had secretly planted the ping program herself. She was in the habit of coming in early to leisure surf at ISDN speed, as tiresomely prohibited by company rules. Reasoning that sooner or later the management would tumble to the out-of-hours usage, she had devised and implemented an alternative explanation before the crunch came.

## Afternoon tea

'More tea, vicar?' enquired Verity Stob.

'I don't know, Verity,' said the vicar, proffering her porcelain cup. 'Not even your delicious Wild Strawberry and Nettle Tea, naturally caffeine-free though it is, can cheer me up.'

'I'm sorry to hear that. What's on your mind?'

'As you know, I gave my best ever sermon to the Microsoft Visual Programmers Group on Good Friday. Everybody seemed really keen, lots of enthusiasm. I thought I had made the big breakthrough and brought the Message to that notoriously Godless section of society. "On the Third Day, Christ rose again," I said, and they all lapped it up. So I thought they'd all be back for my special Easter Sunday service, but in the event...'

'In the event, only half the Visual Basic programmers turned up, and none of the Visual C++ or Visual J++ programmers.'

'Gosh Verity, that's right. How did you know that?'

*Yes, how did Verity know that?*

In Java and C++, arrays are zero-based. So users of those languages would expect Christ to rise on `day[3]`, ie Bank Holiday Monday. In VB, arrays can be zero- or one-based, so half of them turned up on the correct date.



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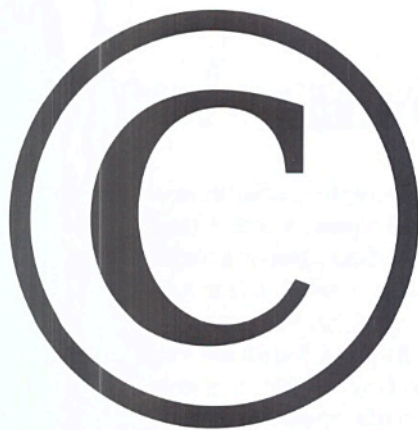
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