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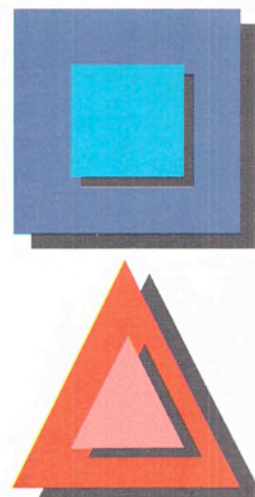
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More hands welcome

GUIs are a bad thing, and this applies on many levels. As I write this opinion piece I need two hands on the keyboard to touch type and a third hand on the mouse to navigate through the document. Problem is I only have two hands! The move to and fro between keyboard and mouse is a real hassle. No better system has really emerged, even though WIMP (Windows, icons, and mouse pointer) has been popular for over 20 years. The trackpoint does solve some problems but this is not ideal either.

Of course, this is not the only issue. Another grudge I have, still from a user point of view, is this whole desktop metaphor. Don't get me wrong, I am all in favour of metaphors. Recently reading *Metaphors we live by* (Lakoff and Johnson, ISBN 0-226-46801-1) was a real eye opener. But the desktop metaphor as used in GUIs doesn't work very well at all. It has too many mismatches with real desktops. I can, and I do, have my desk in a real clutter, but I can nearly always find any paper in just a few seconds. I can't say the same thing about finding a document on my computer. And no, I definitely do not leave my wastebasket on top of my desk.

One amusing point is that it seems that Doug Englebart, the inventor of both mice and GUIs, is also dissatisfied with their current use. When he invented the mouse, he devised at the same time a one-hand operated chording device: one hand on the mouse and the other on the chording device. More natural for us two handed humans. (You could always use your feet; a Ctrl-Alt-Del foot pedal was recently advertised on the Web!) On Englebart's appreciation of today's GUIs, here's a quote taken from *Technology Review*: 'Here's the language they're

proposing: you point to something and grunt.'

Diabolical as they are, graphical interfaces do make controlling a computer easier (and prettier) than from the command line, but so far this has happened with some power taken away from users. For anything a bit complex, grunting a double-click just won't do. The next best thing is going through screens of parameters/configurations in what are usually called preferences or options. To help in this maze of tick boxes, there are the ever helpful ToolTips and contextual help, except that more than half the time they're



For anything a bit complex, grunting a double-click just won't do. What is needed are pipes and filters.

not fully implemented or out of date; and the help system is just slow enough to dissuade you from using it in the first place.

Back some fifteen years or so, a friend working in a training company explained to me how easier it was training people to use DOS than the Mac. In one case they had recipes to type for each goal they were trying to achieve. True, they didn't always understand the deeper meaning of the incantations they were typing but it did work. On the Mac, the users had to understand the full desktop metaphor and then all its flaws before they were able to do the simplest operation. In other words, the learning curve was steeper for GUIs. How counter-intuitive.

Yet, I haven't touched on my main beef. In the good ol' days of Unix, most command outputs could be used as the input of other commands, and there was a cracking good shell. Okay, this is still available today in GNU/Linux and all other Unixes, but it is mostly lacking in the standard Windows platform (you can always add so many add-ons to give it a Unix feel).

Extending the power of simple commands by combining them together is something that Unix users (including many developers and most system administrators) miss terribly when moving to a

complex and unforgiving world. Make a typo in your `.procmailrc` and all your mail might go ashtray. Dumbing down the interface does offer protection against many errors and safety for the fools.

Xerox was where the first computer with a graphical user interface was invented. For the past thirty years we've essentially been using the same technology. Some say the Alto was even better as a computer than today's offerings (within the limitations of the time). The pipe and filter metaphors have continued their own life in a quite separate way. Either you get a CLI system, and get the power and accept being bitten sometimes, or go for a GUI and accept its many limitations.

Except that it doesn't have to be this way. Graphical interface designers and system programmers should work together to make the best of both worlds. One possible scheme would be to have a core system based on the pipe and filter metaphors with most if not all programs written to take advantage of them, and on top of it a GUI with a real visual development system where you could draw lines from the output of a program to the input of another and annotate the links with some constructions describing any kind of regexp. Pre- and post-conditions perhaps. This should work in such a way that these two representations are functionally equivalent. One could use either one or go from one to the other and back. That would be a better way to edit programs... and documents. But that's enough about this suggestion; I should let others offer even better schemes...

David Mery

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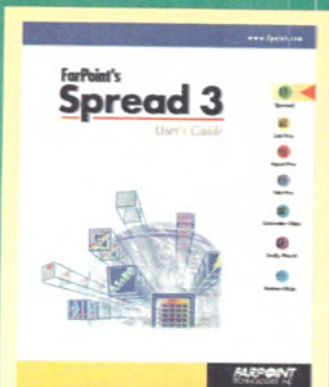
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InterBase forced into Open Source

In a surprise move, Inprise has announced that the next version of its InterBase product will be released under Open Source licence. Currently at version 5.6, the source code for InterBase 6 is scheduled to be published in the first quarter of this year. Platforms that will be supported include Linux as well as Solaris and NT (it will be Open Source in all versions).

Inprise's hand was forced before Christmas by the mass resignation by senior members of the InterBase team. These individuals went public, posting to Usenet newsgroups, pressurising Borland to release InterBase as Open Source – to which pressure the company rapidly acceded.

Despite being a long-established, fully-tested, widely ported and, in its time, innovative application, InterBase has only ever enjoyed limited success in the market. Since acquir-

ing the product as part of the Ashton-Tate/dBASE package, Inprise has struggled to establish the product in a niche dominated by Microsoft, Oracle and Sybase.

The exact nature of Open Source licences has not yet been made public. However, Inprise has announced that a separate company will be set up to manage the process, with money made on service and support.

The InterBase company was formed when Borland originally spun off the RDBMS over two years ago. Inprise intends to continue to sell and support InterBase 5.6 through normal distribution channels.

According to Dale Fuller, interim CEO and president of Inprise: 'By Open Sourcing InterBase, we will be unleashing a world-class database for companies worldwide to develop and deploy business-critical, mobile computing, and Internet-

based applications for multiple platforms, including Linux, Solaris and NT. This is an amazing opportunity for Inprise, its customers, and the Open Source community.'

While the Open Source community must be rubbing its hands in glee at this latest 'acquisition' – and an economically scalable system is a further plus for migration to Linux – the words 'fools', 'rush' and 'in' spring to mind at the prospect of modifying the code of a back-end database.

Debate has already started as to whether there are prior claims to the title of 'first major Open Source database', with PostgreSQL (now at version 6.5.3, and a direct precursor of Ingres) having been 'open source' since its development started in 1977.

Further details of the roll-out plans for the InterBase Open Source project will appear on the Inprise website.

www.inprise.com

Sheridan is bundling all its most current tools and ActiveX components within a **Developer Suite**. It includes ActiveToolBars Plus, ActiveThread Plus, ActiveListBar, ActiveTreeView, DataWidgets 3.1, Designer Widgets 2.0, Calendar Widgets, VBAssist 5.0 and **Code-Assist** 1.1. A Single Developer licence for v1.0 costs £699.

www.componentsource.com

The access and integration of real-time **XML** data across applications like VB and Allaire **ColdFusion** is provided by Merant's **DataDirect Connect** for XML. This product is one of the technologies of Merant's **Egility** data integration range of products.

www.merant.com/datadirect

Unify has committed to supporting the Java 2 Platform, Enterprise Edition (**J2EE**). As well as the J2EE-based application server Unify eWave Engine, the **e-business** component framework Unify eWave Commerce will support the platform.

www.ewavecommerce.com

Rational TestFoundation for Windows 2000, which is an extension to Rational TeamTest, provides an automated system for **Windows 2000** Application Specification-compliance testing. Test Foundation is a collection of tools and documentation to automatically ensure compliance as part of the normal testing cycle.

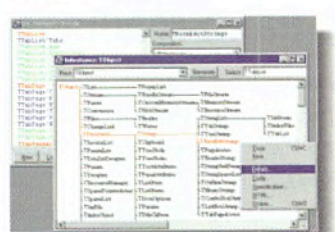
www.rational.com

Pervasive's **Tango 2000** Application Server and **Pervasive.SQL 2000** Server software is available for **Solaris 7**: they can be deployed to Sun's 64-bit operating environment. The Solaris model is compatible with the rest of the Tango 2000 product family.

www.pervasive.com

Juggling software with WinA&D 3.1

Not only does it help with system analysis, requirements specification and software design, but there is code generation, too. The tool in question is Excel Software's WinA&D. It uses structured analysis and design, object-oriented modelling using notations that include UML, and data modelling of information systems.



Version 3.1 sees the capability of generating custom HTML-based reports from software models. The scriptable report generator processes an HTML text file with special tags that get replaced with information from the design model. The generator is extendable with custom tags that run user-written procedures stored in an in-process DLL. Excel Software sees benefits in combining CASE tool-quality analysis with HTML to provide technical documentation, design reviews, and the distribution of maintenance information.

For modelling, the tool has diagram editors for process, data, class, state, object, structure and task models, which are integrated through a global data dictionary. Each model can contain one or more diagrams, the items for which can be shown or hidden. You can configure which types of diagram objects are shown in an item list to suit specific needs. A contents view can be used to

navigate between diagrams or to select specific diagram objects by clicking on the items. You can access properties, details, text specifications and code for a selected item.

An inheritance graph (pictured) can be generated from root classes in the object-oriented design dictionary. Several inheritance

graphs can be shown at the same time with different root classes allowing you to focus attention on specific areas of design. Class properties and code can be accessed from the inheritance graph.

A palette of colours is also available to the designer. For each diagram type, the default outline and background-fill colours can be assigned to each type of diagram object. To mark or highlight individual objects, you can select the objects and click the colour palette in the tool bar. Entry names in the data dictionary can be automatically coloured based on element type, making it easier to locate specific types of entries.

The tool also provides design verification reports and text import/export features.

WinA&D 3.1 is available in four editions: Developer at \$1,995, Desktop at \$1,295, Educational at \$845 and Standard at \$495.

www.excelsoftware.com

All change for the year 2000

JBuilder 3 Foundation (JBuilder for Linux) is a cross-platform development environment for creating Java 2 platform-based apps for Linux, Solaris and Windows. As well as the AppBrowser and **CodeInsight**, there is a graphical debugger. Available for free download. www.borland.com/jbuilder/foundation/

Inprise has developed its infrastructure support for Internet-based e-business applications with the release of Inprise **Application Server 4.0** and **VisiBroker for Java 4.0**. Inprise claims it to be the first Application Server to combine EJB and Corba technology for Web apps. www.borland.com

You can add a colour **syntax-highlighting** text editor to apps with **Tetradyne Software's SourceView 2.2 ActiveX**. Features include supporting multiple views of a single text document, splitter panes, row/column-based insert, delete and copy methods for precise text manipulation, and the use of bookmarks. It costs £227. www.tetradyne.com/srcvwx.htm

A beta version of GoLive Dynamic Link for **ASP**, a new e-commerce module for **Adobe's** Web design and publishing tool **GoLive 4.0**, is available from the Web. It enables database binding to be implemented directly within GoLive, and can generate ASP code to interact with Microsoft Commerce Server. www.adobe.co.uk

Built with Delphi. This is the criterion for all the commercial, shareware and freeware products listed on **Baltic Solution's** website. The company is inviting submissions to be added to the **listing**, which it describes as a service to the **Delphi** community. www.balticsolutions.com

Intasoft, the software tools specialist, has created the next generation of its configuration management system, **AllChange**. With the emphasis on flexibility and ease of management, AllChange 2000 has a number of new features. As well as browsing and controlling files on remote platforms, and attaching files to change requests and release definitions, you can build relationships between configuration items to help the impact analysis process, and also transparently access AllChange 2000 through Microsoft Word and Explorer (pictured).

You can automatically generate release notes and known error lists from within Word, and embed automatically updated data fields in the Word documents.

FTP functionality has been integrated into the command structure of AllChange 2000, enabling FTP commands to be issued without user intervention. This provides remote access to platforms sup-



porting FTP implementations from any NT client. By this means, directory structures on the remote machines can be browsed to select files for processing – for example, to be checked in.

To help provide context for actions, any type of file can be linked to change requests or release definitions. Intasoft suggest this facility could be used, for example, by testers to attach screen dumps or other test evidence to any error reports that are created. The attachment can take the form of being a link to the original document or of being a secured copy of the file.

In terms of impact analysis, relationships can be created between any of the configuration items held in the AllChange 2000 database either manually or automatically upon certain actions or conditions being met. The tool can also highlight or warn of relationships that exist whenever a configuration item is accessed.

Release notes can be automatically generated from within Word from the relationships managed by AllChange. Known errors are identified by the system from the change requests that testers have failed.

AllChange 2000 is priced from £3,457 for a 5-user licence under Windows. It runs on Windows 9x and NT 4 (it performs its cross platform support via the integrated FTP feature). It is backwards-compatible with previous versions of AllChange with the use of an upgrade tool.

The upgrade is free to existing clients who have a current annual support agreement with Intasoft. www.intasoft.co.uk

Device independent Palm readings

PalmOS 3.5 has been made available under **NDA** to developers. This is the first full release of PalmOS that is device independent, and was developed by the newly-created **Palm Computing Platform group** (now distinct from Palm Devices).

The main new features of PalmOS 3.5 are support for colour, some UI enhancements, a web clipping API and full localisation for Roman and Japanese languages. The OS includes a detailed **Hardware Abstraction Layer**, with the introduction of a **Hardware Reference platform**. Expect first products from licensees based on this version around May/June.

Work has also started on the next revision, **PalmOS 4.0**. This version will support communications better, with the addition of phone-oriented services: a phone API will complement the handheld API set. Another goal is to allow licensees more freedom to mix and match ROM configurations; a more modular design should allow easier customisation. Expect this version for the end of this year or beginning of 2001.

Palm is bullish concerning work done on PalmOS at the request of the Finnish company **Nokia**. The kernel will be **Symbian's EPOC32** and it will run on the **ARM** architecture. Palm has stated that all development will be available to all its licensees.

HandSpring's Visor will be launched in Europe this quarter. This is a **PalmOS-based** device with a port for 'SpringBoard' modules. The OS is **PalmOS 3.1** (same as in the **PalmV**) with additional support for the **SpringBoard** modules, **USB** and the **Euro character**. A full development kit is available for free from the web.

www.palm.com/devzone/ www.handspring.com/developers/

Zero admin

SMP-based scalability combined with zero administration. This is the boast of **Centura Software** for the major new version of its cross-platform data management server. **Velocis Database Server 3.0** is targeted at e-business systems using Linux, Unix, or Windows NT.

Version 3.0 sees the introduction of direct linking to Web servers with **Velocis Application Server Technology (VAST)**, re-entrancy on the server and the symmetric multiprocessor support (SMP).

VAST allows applications to link directly to the database server process. This has been designed to avoid the typical overhead of DBMS connectivity.

Velocis Database Server 3.0 is available for Windows 9x, NT 4.0 (Intel), and **Red Hat Linux 6.0** (Linux Kernel 2.2.9). Availability on **AIX 4.3**, **DSDI 4.1**, **HP-UX 11**, **Solaris 2.7** (Intel and Sparc), **UnixWare 7** and **Windows 2000** (Intel) will follow.

www.centurasoft.com

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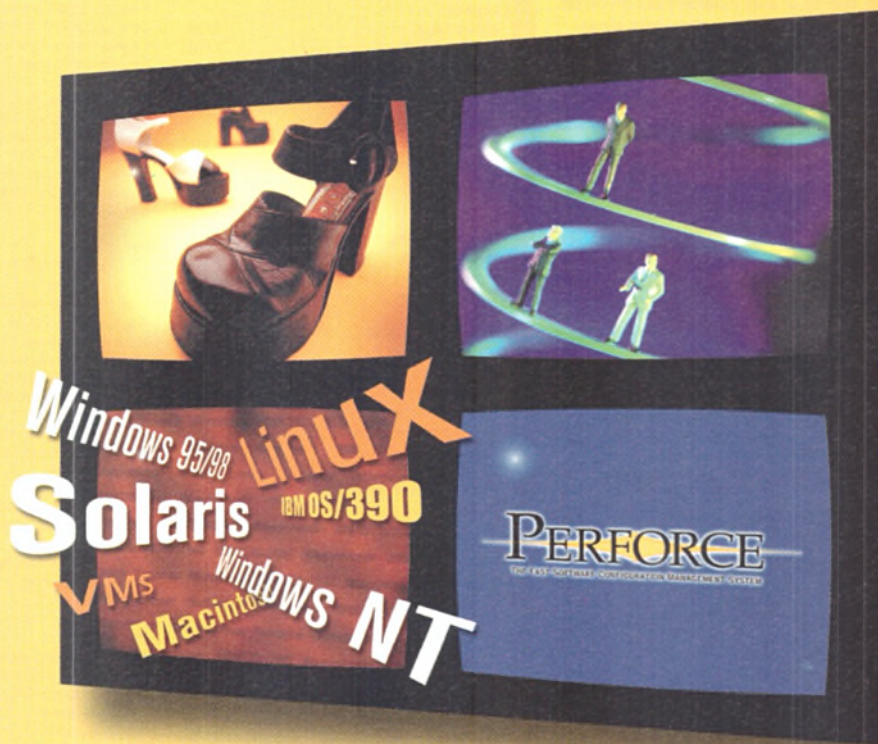
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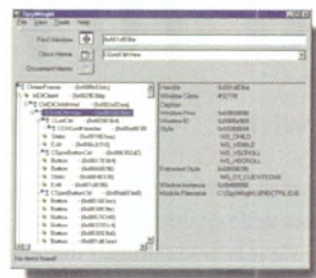


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SpyWright on running MFC

With Premia's SpyWright you can examine a running application to identify C++ classes, which includes the MFC. The tool displays the class names in a graphical hierarchy, and by selecting a class name you can go directly to its source code (if the source code is available, of course).

An Active Application Source Code Browser is used to identify a graphical hierarchy of C++ class names and structures. All the ele-



ments of the selected window (and its child windows) are presented in the hierarchy, including the win-

dow's frames, toolbars, buttons and controls. There is a Name Completion feature to find unknown class names within the application.

SpyWright also works for any scanned CodeSense databases built with Premia's CodeWright, with or without running the MFC application. With the application open, you can generate a graphical Class Hierarchy. Its price is \$99.

W www.premia.com

Shake a stick at software experts

Attendees at JaCC will again be spoilt for choice of software experts. Covering important aspects of contemporary software development, the event takes place on 24 and 25 March, at the Oxford Union. The Friday sees C++, Java, and Efficient Programming tracks following a keynote from James Coplien entitled *Teaching Design: The rest is SMOP*. For C++, 'Guru of the Week' Herb Sutter gives a talk entitled *Exception Safe C++*, which is followed by Dietmar Kuehl's *Object-Oriented Programming versus Generic Programming* (the first part will cover the differences while the second part will talk about the combination of both approaches). For Java, Andy Longshaw kicks off with *Creating Web-based Systems with Java Server Pages*. Steve Cornish takes on *Java Enterprise: The Tools of the Trade* followed by *SAX and DOM and Rock and Roll*, which will examine the two most popular mechanisms for manipulating XML from Java: the Simple API for XML (SAX) and the Document Object Model (DOM). Dov Bulka starts the Efficient Programming track by focusing on C++.

Saturday begins with Herb Sutter's *Programming in the Distributed Millennium* and the day splits into 3: C++, Design & Development and Java. Leen Ammeraal begins the C++ track with *An Introduction to Function Objects*, followed by Jon Jagger's *Reflections on C++* and Francis Glassborow considering *Object & Value*. For Design & Development, Kevlin Henney talks on *A&D*, and Frank Buschmann and James Coplien present *Development with Patterns*. Java's track includes Dov Bulka examining *Java Performance and Scalability* and a *Using Patterns in Java workshop*.

W www.accu.org

Crypto ASP

CryptoObject v 1.0 is a utility that enables cryptography from within Active Server pages. It's a COM object that wraps the base cryptography functions provided by the Microsoft Cryptographic API. This has a traditional handle-based design, which works better for C++ and VB than it does for IIS/ASP...

To help reduce any learning curve for such VB or C++ developers, the wrapping of the Microsoft SDK uses the original constant names, function names, member variables and error codes. The resulting COM object also contains embedded help information to allow Visual InterDev to provide context help information.

A single server licence is available for \$100 – it can be ordered from the Web.

CryptoObject version 1.0 runs on Windows 9x and NT.

W www.cryptoobject.com

One from the 'Still with us!' department: Computer Associates' **Visual Objects** 2.5 is designed to combine the flexibility of object programming with visual development tools and repository-based application management. You can create 32-bit Windows apps, OLE /COM components and **Internet** client and server modules. V2.5 includes client-side integration with **Jasmine**, additional class libraries and Visual SourceSafe support. It costs £310. www.greymatter.co.uk

Developed jointly by Motorola and Cambridge Control, the Motorola DSP Developer's Kit integrates Motorola's **DigitalDNA** development environment with MathWorks' **Simulink** and Matlab **DSP** (digital signal processing) design tools. It's a software development tool that will simulate and test algorithms for Motorola's 56300 and 56600 families of fixed-point DSPs. www.camcontrol.co.uk

Visual Vision's **iPer** is designed to simplify the creation and management of **hypertext** documents. Hundreds of functions allow for the development of web pages, **e-books**, CDs and any other interactive document. For Windows 9x and NT, it employs a WYSIWYG interface and pricing starts from \$19. www.visualvision.com/iperv

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Portable and loveable

Jules has found a portable computer he can live with.

I'm writing this month's article, as I wrote the last two, on a portable computer. You may think that's not much to talk about – portable computers have been around for a long time now – but for me it's something special because I've never found one I could get on with.

Since I built my very first computer (an MK14, if you remember them), I have wanted to make something truly portable. All the time I've been thinking, I've been coming up against the same problems that everybody else has. The requirements of a truly interactive, portable device are in conflict with each other, and every design has to resolve a whole set of compromises. The problems come about because a computer is a general-purpose device that demands a complex interaction with its user, and it has several modes in which that interaction can take place.

Consider other, non-computer portable devices. My watch, for example, contains more computer power than most industrial computers from the days of my MK14, but since all I ever do is look at it, a few buttons are sufficient to operate it.

But, a computer is different. For one thing, a major use of a computer is note-taking. A full-sized keyboard seriously restricts the portability of a machine, but smaller keyboards have terrible problems. I have a Psion 3a whose keyboard was intolerable, and completely unusable by anyone with long fingernails. I've seen chord keyboards (anyone remember the Microwriter?), and I've even designed my own, but chord keyboards are slow and tiring because you need to keep all

your fingers working at once. They also require the dexterity of a virtuoso pianist, so few people invest the time in learning how to use them. Alphabetic telephone keypads are effective for short messages but are still no good for sizeable text entry. In the absence of any other effective text input devices, a full-sized or $\frac{3}{4}$ -sized keyboard seems essential.

The next problem is a display device. Just as with monitors, the bigger a display is, the better. Unfortunately, big displays are expensive, delicate, and power-hungry – colour even more so because it requires backlighting. Toughness is a big issue in a machine that is likely to be thrown in a briefcase (or a pocket), because the more likely a breakage is (and the more expensive the repair) the more information you stand to lose (and for longer) when the inevitable happens.

Conventional clamshell laptops go for big screens, protecting them when they're not in use by the outer case, and making the displays from special glass. I guess it helps, but not enough – most of the damaged laptops I've seen have broken screens, and replacing a screen is rarely cost-effective. Laptops also have the problem that they're big and heavy, and likely to topple over when placed on a moving lap (in a car, or on a train).

So, there's a case to be made for using the smallest possible screen consistent with the operation of the computer. That rather rules out operating systems like WinCE, because it wastes too many pixels on decoration. Pixels are too precious to waste on anything other than primary function. So

what is the primary function of a portable computer?

First is note-taking. I think there's the kind of note-taking where you want to write a letter, or an article, or a best-selling novel, on the way in to work on the train. The second type of note-taking (which, as far as I'm aware, no machine, portable or stationary, has addressed) is to take notes in a lecture, and then use the machine to organise them later. In both cases, the keyboard needs to be silent – the kind of clicking that is acceptable on a desktop would be quite out of place in a lecture. Adding intelligence to the notes is essential these days. Being able to embed spreadsheets, pictures, contacts, and fragments of program code into a note would make the device almost as effective as paper.

When you're on the move, you're likely to get frequent, unscheduled interruptions. For that reason, portables would be good at the kind of tasks that don't take much time, but have to be done. Reading faxes and emails (and answering them, if the keyboard was appropriate) is just that kind of task. Searching for information (though not necessarily reading it all) is another. The Nokia communicator would be great, if it weren't for the appalling keyboard.

Contact management and a diary is something that needs to be small enough to fit in a pocket, yet will still accept short text entry, and the screen should be big enough to be legible. It should be cheap enough not to mind getting broken, and backup facilities are crucial. There's the Oregon Scientific 256K (£50 from Tesco), which

has no keyboard, but a touch-screen, and the Franklin Rex, which is tiny, but incredibly fiddly to enter text into.

As you can see, there's nothing that can do all the things I'm asking for. So, what computer am I using? Actually, I'm using a mixture, and I'm still not satisfied. But this article is being written on a Z88. I've had it for ages, and never really used it because it had that dreadful Pipedream software (which was not bad as a spreadsheet, but was lousy for note-taking). Recently, though, I've bought a proper wordprocessor for it (the spell-checker is smarter than the standard Windows one), and a flash memory card (so I can back up files properly – there's no backup battery in the box), and I've discovered it's a really good note-taker. It's fast, quiet (the rubber keyboard is a treat!), and doesn't eat batteries.

On the one hand it's good that a 15-year-old machine, which isn't even being made any more can be better than any modern machine at such a key task as typing. On the other hand, it's a sad reflection on modern development that, no matter how much money I'm prepared to spend, I can't find something better than a 15-year-old machine that is seriously showing its age, and that is supported only through the efforts of enthusiasts. ■

Jules is keen to sample any obscure machinery that he may have overlooked. Call him on 01707 662698, or email mayhem@jules.cix.co.uk. The Z88 is still being sold and supported by Rakewell (homepages.nildram.co.uk/~rakewell/z88/z88.htm).



Ariane 5

Dear Sir,

I'd like to respond to Alun Williams's mention of Ariane 501's failure (*Four days in Oxford: A day for enthusiasts*, EXE, November 1999). As he said, the failure was down to a cast from a 64-bit floating point number to a 16-bit integer.

I'm not excusing the software, but the fatal cast is more a symptom of a problem (well, three) than the problem itself.

- The embedded software of the Inertial Reference System (SRI, part of the Flight Control System) in which the routine resided experienced repetitive success, not failure. The previous successes were in a different context though – they weren't with Ariane 5 but with earlier members of the Ariane launcher family. The software was given a value too large for earlier launchers to achieve thanks to Ariane 5 being able to attain larger accelerations. Ariane 5 launchers have a velocity vector of 60 metres per second horizontally (yep, sideways) after 30 seconds but, for example, one of the 6 versions of Ariane 4 (Ariane 44P) would have a horizontal



vector a sixth of that: just 12 metres per second.

- Only so much testing was done with Ariane 5. Because software was seen as peripheral to what it's there for (the hardware), it wasn't given thorough testing with the next installment of the Ariane launcher series. After the accident, in order to ensure more attention to the software, a 'Software Architect' role was established so that embedded software would no longer be seen as a minor subset of hardware. It was also decided to improve environmental representations 'through systematic use of real equipment and components wherever possible' and elsewhere to test using as realistic models as possible.
- Now get this: the routine in which the overflow occurred had no business running at the time it shut down the processor. It was used to calibrate the frame of reference during initialisation before lift-off. Once the craft is

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flying it produces no meaningful results. Beforehand this did no harm (see the first problem listed above). Wirthian languages are recognised for their enforcement of structured programming, but if a serial language such as C had been used instead of Ada, which is multitasking and concurrent, then would programmers have allowed a routine to keep running several seconds after its required lifetime? It was promptly decided there would be a 'switch-off of alignment mode after lift-off', 'suppression of all functions not used during flight' and 'analysis of redundancy logic'. You can check up these articles:

Insufficient Software Testing Caused Ariane 5 Failure, SPACEVIEW, Space, Volume 12 – Number 3/4 – Summer 1996, Parker Publications Ltd

Ariane-5: Learning from Flight 501 and Preparing for 502, J. de Dalmau & J.Gigou, ESA Bulletin, Number 89 – February 1997

Ariane-5: Overview of the post-501 operations, J. de Dalmau, Reaching for the Skies, No. 17 – August 1997, European Space Agency
Colin Paul Gloster
Ashbourne
Co. Meath, Eire

While at university I took four modules in C/C++ programming and one in object-oriented design. Now, two years later, I'm finding it very tough to come to grips with C++ again. C++ syntax is a mess and there seems to be countless ways to write one line of code. This is not too bad when writing your own code, but when it comes to understanding someone else's there are bound to be areas where they use unfamiliar syntax.

Alex Telford explains syntax in a way that I've seen in many teach yourself C++ books: *the result meaning "integer pointer"*.

The code is translated into English. I find these translations very useful.

My idea is that by right-clicking on a line of code in your C++ IDE you could view a translation from C++ into English for that line.

I posted this idea on a programming forum but got a lot of negative responses. Some said the translation would be more difficult to understand than the code. Others said you would learn less using this type of help.

I liked the idea of using a full range of symbols to denote the different constructs in the language. Maybe this could be used as a halfway translation.
Mat Clark
clarkm@rca.org.uk

Exe's annual Salary Survey

Please remember we need your help to make our Salary Survey a success. The more responses we receive the better the picture we will be able to draw. Last year's response was above our expectations, but we want to at least match it this year.

The questionnaire is anonymous and all details will remain confidential. Just tick which job you do, fill in your rate of pay and tell us a bit about your track record, then send the form to us (postage paid). And please pass it on – photocopy the survey and get your colleagues to complete it too. The more of you who respond, the more accurately we can tell you what the going rates for your skills and experience are.

As a further incentive, for each completed questionnaire we receive, we will again give £1 to either the Bletchley Park Trust (www.cranfield.ac.uk/cc/bpark/) or Intermediate Technology (www.oneworld.org/itdg/index.html).

Don't delay and remember to tick which charity you prefer us to donate to.

C++ into English

Dear Sir,

I've just read the article *Programmer intelligence – self-selection of the species?* (EXE, July, 1999) and found it very interesting. I am currently working on small projects using Visual Basic but wish to move into games programming, so I need to be fluent in C/C++.

Y2K winner

Dear Sir,

We read a lot about the failure of the Y2K bug to strike. Well, one of my programs went belly up on New Year's Day, thanks to a two digit date.

Do I win £5?
Simon Ashworth
North London



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Extending CodeRush

Dave Jewell plugs in to the SuperComponent architecture of CodeRush 5.0

For those who don't know CodeRush, it's a monster-sized, productivity boosting add-on for the Delphi IDE (I reviewed CodeRush 3 in *The ultimate Delphi fashion accessory?*, EXE, June 1998). As supplied, CodeRush consists of a core engine that integrates into the IDE together with a number of so-called 'plug-ins' that extend IDE functionality in various ways. You can find CodeRush at the Eagle Software web-site (<http://www.eagle-software.com>).

This article is part CodeRush 5 review, but mostly hands-on tutorial: I hope to get you excited about writing your own IDE add-ons using the CodeRush architecture. And if you don't feel excited about that, then tough.

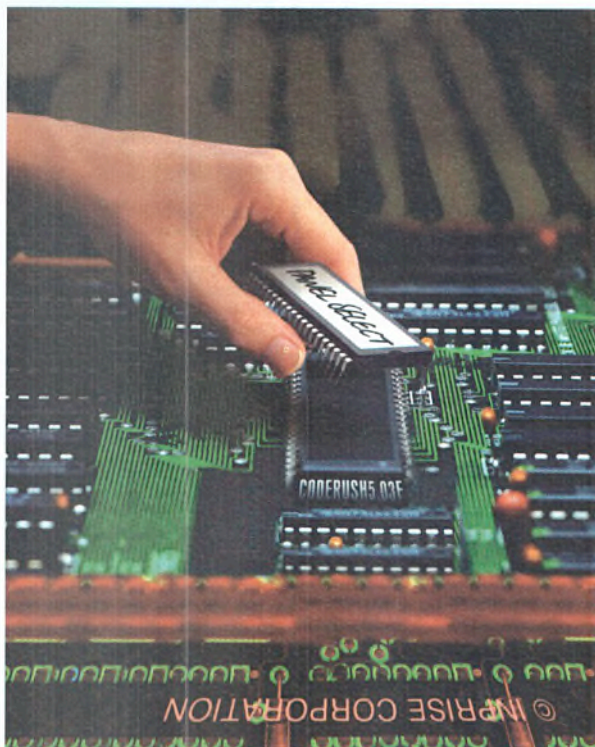
SuperComponent architecture

The greatest advantage of Delphi, Visual Basic and other RAD tools is that you can visually lay out the controls on your form at design-time, setting up properties and connecting everything together with event handlers.

Unfortunately, back in the days of CodeRush 3, it wasn't possible to design your plug-ins using Delphi's form designer, meaning that creating your own plug-ins was frankly rather a pain in the nether regions. What it all boiled down to was that if you wanted to place (say) a button on a form, you had explicitly to write the code to create the button. If you wanted the form to be a certain size, you had to write the runtime code to size it. If you wanted the act of clicking the button to perform some action, you had to create manually a runtime association between the button and the event handler. It was all deeply tedious. I mean, it's not as though we're using Visual C++ here!

The good news is that this all changed with the advent of CodeRush 4 and 5, thanks to what Eagle refers to as 'SuperComponent architecture'. Now you can lay out the form of a plug-in just as easily as if you were creating an ordinary application. The components on your component palette can be added to a plug-in form and manipulated in the usual way. The only exception to this is the `TMainMenu` component because the IDE already has a menu located in the IDE's main window where the component palette is itself hosted.

There are other big benefits of the SuperComponent architecture. All plug-in forms are ultimately derived from an undocumented IDE class called `TDockableForm`. This class is used to implement built-in windows such as the Object Inspector, Project Manager and so forth. The bottom line is that your own plug-ins can now be docked into the standard IDE windows, and to all intents and purposes look and behave indistinguishably from the 'natives'!



A better shortcut reference plug-in

Without further ado, let's roll up our sleeves and try creating some new plug-ins. CodeRush will essentially allow you to create two different sorts of plug-ins: Panel and Standard. A Panel plug-in appears as a form and can be docked with other windows as described above. A Standard plug-in, on the other hand, is relatively 'faceless' and might simply appear as a new menu item, another button on a Delphi toolbar, or enhance the IDE functionality in some other way. I'll present examples of both plug-in types in this article.

The first one I want to show you is a replacement for the CodeRush Shortcut Reference plug-in. This Panel-based plug-in is designed to show all the available commands that are recognised by CodeRush, together with the keyboard shortcut that's currently associated with each command. The original Short-

cut Reference plug-in wasn't very impressive: it used an ugly mono-spaced font to line up its columns of text and it didn't always display anything when it was first loaded, requiring that the 'Refresh' menu item be clicked in order to get something useful on screen.

My replacement is shown in Figure 1, with abbreviated source code in Listing 1. (Full source to all the plug-ins presented in this article can be downloaded from EXE OnLine.) A Panel-based CodeRush plug-in is a descendant of `TCodeRushPanelForm` class, which in turn is a child of the aforementioned `TDockableForm`. You'll notice that an empty class, `TShortCutReferencePlugIn`, is also declared. This descends from the generic `TCodeRushPanelPlugIn` class. It acts as a proxy, allowing the core CodeRush 'engine' to communicate with the plug-in. The empty class also acts as a vehicle for registering the plug-in with CodeRush.

To create this plug-in from scratch, fire up the Delphi 5 IDE with CodeRush loaded, and select the New Plug-In item from the CodeRush menu. This gives you a choice of Panel-based or Standard plug-ins; choose Panel. At this point you'll be asked to give a name for your plug-in. I called it `ShortCutReference`, and you'll see this is the class name of the form that gets created.

Once you've named your Panel, you can start adding items to it in the usual way. I used a `THeaderControl`, allowing the user to resize the relative column widths of the Command and Shortcut columns on the fly. Re-sort the display by clicking on the appropriate column header, and click again to toggle the sort order between ascending and descending — just like Explorer. You'll see from Figure 1 that the `THeaderControl` displays a couple of up/down-arrow glyphs depend-


```

unit ShortcutRef;
interface
// ...
type
  TSortOrder = ( soCommand, soKey );

  TShortCutReference = class(TCodeRushPanelForm)
  PopupMenu: TPopupMenu;
  // Menu item declarations omitted
  ListView: TListBox;
  Header: THeaderControl;
  Images: TImageList;
  procedure CodeRushPanelFormCreate(Sender: TObject);
  procedure RefreshMenuItemClick(Sender: TObject);
  procedure ShowAssignedClick(Sender: TObject);
  procedure ConfigureClick(Sender: TObject);
  procedure HeaderSectionClick(HeaderControl: THeaderControl;
    Section: THeaderSection);
  procedure ListViewDrawItem(Control: TWinControl;
    Index: Integer; Rect: TRect; State: TOwnerDrawState);
  procedure CodeRushPanelFormResize(Sender: TObject);
  procedure HeaderSectionTrack(HeaderControl: THeaderControl;
    Section: THeaderSection; Width: Integer;
    State: TSectionTrackState);
  private
    { Private declarations }
    procedure Refresh;
    procedure SortItems;
  end;

  // CodeRush PlugIn:
  TShortCutReferencePlugIn = class(TCodeRushPanelPlugIn)
  // Empty body
  end;

procedure Register;
implementation
($R *.DFM)

var
  SortOrder: TSortOrder;
  SortAscending: Boolean;

function ShortcutSortProc (List: TStringList; Index1,
  Index2: Integer): Integer;
var
  p1, p2: Integer;
  s1, s2: String;
begin
  p1 := List[Index1]; s2 := List[Index2];
  p1 := Pos('#9', s1); p2 := Pos('#9', s2);
  if SortOrder = soCommand then begin
    Result := AnsiCompareText (Copy (s1, 1, p1-1),
      Copy (s2, 1, p2-1));
  end else begin
    Result := AnsiCompareText (Copy (s1, p1+1, MaxInt),
      Copy (s2, p2+1, MaxInt));
  end;
  if not SortAscending then Result := -Result;
end;

procedure TShortCutReference.Refresh;
var
  Idx: Integer;
  Cmd, Key: String;
  DoAdd: Boolean;
  EventNames: TStringList;
begin
  if CodeRush <> Nil then with ListView do begin
    Items.BeginUpdate; Items.Clear;
    EventNames := TStringList.Create;
    try
      CodeRush.CollectCommands (EventNames);
      for Idx := 0 to EventNames.Count - 1 do begin
        Cmd := EventNames [Idx];
        Key := CodeRush.GetKeyNameBoundToCommand (Cmd);
        // Should we add this item?
        if ShowAssigned.Checked then DoAdd := Key <> '' else
        if ShowUnAssigned.Checked then DoAdd := Key = '' else
        DoAdd := True;
        if DoAdd then Items.Add(Cmd + #9 + Key);
      end;
    finally
      SortItems;
      Items.EndUpdate;
      EventNames.Free;
    end;
  end;
end;

procedure TShortCutReference.CodeRushPanelFormCreate(
  Sender: TObject);
begin
  Refresh;
  HeaderSectionClick (Header, Header.Sections [0]);
end;

```

Listing 1 – A Shortcut Reference plug-in (abbreviated).

ing on the 'sort' of sort that's being displayed. I filched these glyphs from the Outlook Express program and added them to a TImageList control within my plug-in.

The code is pretty straightforward. When first loaded, the Register routine gets called to create an instance of TShortCutReferencePlugIn and register it with CodeRush. This code is automatically generated for you by the CodeRush 'wizard'. The FormCreate routine is called in the usual way, before the plug-in form is displayed. It calls the Refresh method to refresh the view, and then simulates a click on the header control by calling HeaderSectionClick to set up a default ascending sort on the command name.

The Refresh routine begins by clearing the owner-draw list-box that's used to display the command/key pair information. It then calls the internal CodeRush method CollectCommands to retrieve a list of all the available CodeRush commands. This isn't a static list because it's possible for your own plug-ins to register custom commands that can then be called as keyboard shortcuts. You'll notice that the Refresh routine checks to see whether the main CodeRush variable is Nil before proceeding. Ordinarily, this can never be Nil, but if you develop parts of your plug-in as ordinary applications (ie outside the CodeRush environment), then it makes sense to put such checks within your code.

Once the list of commands is retrieved, the code then loops through each item calling another CodeRush function: GetKeyNameBoundToCommand. This retrieves a string corresponding to the keyboard shortcut that's associated with the command, or an empty string if there is none. My plug-in allows the user to display only assigned commands, only unassigned commands, or all commands. Based on the current value of popup menu items, the code then decides whether or not it's appropriate to add a given item to the list-box. Finally, the code calls SortItems to re-sort the list using the current setting.

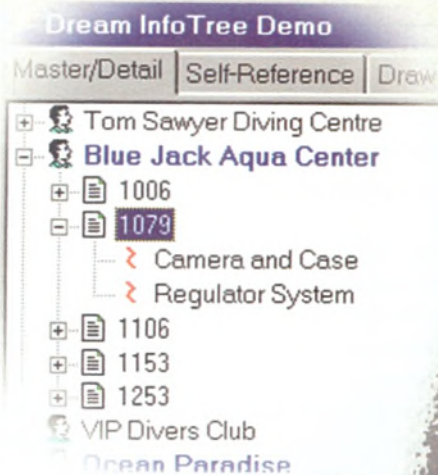
The SortItems routine is needed because TListBox doesn't provide all the sort methods we need. We've got four possibilities: an ascending or descending sort on either the Command or Key column. To cater for these the TListBox control has its Sorted property set to False – we take responsibility for sorting the items and adding them to the list-box in the right order. This is done by calling a little-known method of the TStringList class, CustomSort, which enables us to supply a custom sort comparison routine, ShortcutSortProc, that's used by TStringList's implementation of QuickSort.

ShortcutSortProc is very simple. It examines the two string parameters, finds the embedded tab characters and uses these to do a straight comparison of either the command or key part of the string, depending on the value of the SortOrder variable. The Custom Sort routine doesn't allow you to specify a method of an object – it will only work with non-OO functions. This means that SortOrder and SortAscending have to be implemented as private unit-level variables whereas, ideally, they should be private fields of the TShortcutReference class.

ListViewDrawItem, omitted to save space, is the the owner-draw method called to draw each item within the list-box. It also draws the 3D-look vertical line that separate the two columns.

Finally, the HeaderSectionClick routine is called in response to a mouse click on one of the column headers. It figures out which header got clicked, displays the appropriate up/down arrow glyph, and removes the glyph from the other (non-clicked) column. It also triggers another call to the SortItems routine, so that the shortcut view gets updated to reflect the current sort option.

That's really all that needs to be said about my Shortcut Reference plug-in other than to mention that Mark Miller (creator of CodeRush)



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Main.js

```
if (ShowModal == mrOK)
{
    switch (ReportType)
    {
        case 0: PrintCustom
        case 1: PrintOrder
        case 2: PrintInvo
    }
}
```

138:52 Modified

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```

procedure TShortCutReference.ShowAssignedClick(Sender: TObject);
begin
  ShowAssigned.Checked := Sender = ShowAssigned;
  ShowUnAssigned.Checked := Sender = ShowUnAssigned;
  ShowAll.Checked := Sender = ShowAll;
  Refresh;
end;

procedure TShortCutReference.ConfigureClick(Sender: TObject);
begin
  if CodeRush <> Nil then begin
    CodeRush.InvokeCommand('DlgCodeRushOptions',
      'TbsShortcuts');
    Refresh;
  end;
end;

procedure TShortCutReference.HeaderSectionClick (HeaderControl:
THeaderControl; Section: THeaderSection);
begin
  with Section do begin
    // Figure out which section was clicked
    if Text = 'Command' then
      SortOrder := soCommand
    else
      SortOrder := soKey;
    // Redisplay sort marker according to selected section
    if ImageIndex = -1 then
      SortAscending := True
    else
      SortAscending := ImageIndex = 0;
    ImageIndex := Ord (SortAscending);
    // Next, remove sort marker from other column
    Header.Sections [1 - Ord(SortOrder)].ImageIndex := -1;
    // Finally, the sort !
    SortItems;
  end;
end;

procedure TShortCutReference.SortItems;
var
  SList: TStringList;
begin
  ListView.Items.BeginUpdate;
  SList := TStringList.Create;
  try
    SList.Assign (ListView.Items);
    SList.CustomSort (ShortcutSortProc);
  finally
    ListView.Items.Assign (SList);
    SList.Free;
    ListView.Items.EndUpdate;
  end;
end;

procedure TShortCutReference.ListViewDrawItem
(Control: TWinControl; Index: Integer; Rect: TRect;
State: TOwnerDrawState);
// Implementation omitted to save space

procedure Register;
var
  MyPlugIn: TShortCutReferencePlugIn;
begin
  MyPlugIn := TShortCutReferencePlugIn.Create;
  CodeRush.RegisterInterface(MyPlugIn);
  MyPlugIn.SetFormClass(TShortCutReference);
end;

initialization
finalization
  if assigned(CodeRush) then
    CodeRush.DestroyInterfaces(TShortCutReferencePlugIn);
end.

```

Listing 1 continued

```

unit PaletteSelect;
interface
// (uses omitted)

type
  TPaletteSelector = class(TCodeRushStandardModule)
  procedure CodeRushStandardModuleCreate(Sender: TObject);
  procedure CodeRushStandardModuleDestroy(Sender: TObject);
  private
    { Private declarations }
    TabControl: TTabControl;
    PageMenu: TMenuItem;
    PaletteMenu: TPopupMenu;
    OldPopupEvent: TNotifyEvent;
  procedure ClickPageItem (Sender: TObject);
  procedure PopupIntercept (Sender: TObject);
  public
    { Public declarations }
  end;
end;

```

Listing 2 – A Quick Palette Selector plug-in.

liked it so much that he asked if he could incorporate it into CodeRush as an 'official' plug-in. Never one to turn down an opportunity for self-aggrandisement, I said yes, so if you've recently downloaded CodeRush from the Eagle website, you may already be using it.

A quick palette selector

As a technical journalist, I'm lucky to be able to accumulate numerous Delphi libraries for free, and my Component Palette is bursting at the seams! This wouldn't be a

real problem except for the brain-dead way in which Borland has implemented the palette using those itchy-bitsy little left/right buttons to scroll slowly through the available palette pages. Murphy's law dictates that the page you want is invariably at the other end of the palette from where you currently are, which means that Borland will probably have released a new version of Delphi before you find the component you're looking for.

Fortunately, there's a better way, courtesy of CodeRush plug-in technology. If you look at Figure 3, you'll see that the Component Palette's standard popup menu has been supplemented by an additional 'Page' item. When you select the Page item, you'll see a two-column submenu populated with the names of all the current Component Palette pages. The current page is identified with a tick mark and all you have to do is click the wanted page name to select a new page into the palette. This is my Quick Palette Selector plug-in, the source code for which (again, somewhat abbreviated) is shown in Listing 2.

This time, we're dealing with a Standard (ie non-Panel) plug-in. This means that the plug-in is 'faceless' until the Component Palette's pop-up menu appears. To hook into the Component Palette will require a certain amount of deviousness, as we shall see. Because there's no form, we no longer have a FormCreate handler, but we can still get control at the time the plug-in is instantiated via the OnCreate event handler.

Note: When working with Standard plug-ins, you'll see what looks like a form in the IDE at design-time. This is a sort of proxy form that's used to surface all the events and properties associated with a Standard plug-in, making them accessible to the Object Inspector.

Inside our OnCreate handler (see Listing 2), we use a little intimate knowledge of the Delphi IDE to search for a component called `PaletteBar`. This corresponds to the Component Palette. Bear in

Command	Shortcut
BookmarkJump	CTRL+SHIFT+J
BookmarkNext	CTRL+SHIFT+ALT+Down
BookmarkPrevious	CTRL+SHIFT+ALT+Up
BookmarkToggle	CTRL+SHIFT+B
ClipboardAppendModeToggle	CTRL+ALT+A
DlgSmartClipboard	SHIFT+Num +
FocusClassList	CTRL+ALT+C
FocusMethodList	CTRL+ALT+M
FocusQuickJumpList	CTRL+SHIFT+Q
MacroPlay	CTRL+P
MacroRecordToggle	CTRL+R
MarkerCollect	ALT+End
MarkerDlco	ALT+F7
MarkerSwap	SHIFT+ALT+Home
MethodImplementationJump	CTRL+SHIFT+M
MethodNew	CTRL+M
MethodNext	CTRL+ALT+Down
MethodPrevious	CTRL+ALT+Up
MoveNewModifiedLine	CTRL+SHIFT+N
PanelHideAllToggle	CTRL+SHIFT+F5
PanelPresetsCycle	CTRL+SHIFT+ALT+F5
PaletteReplaceWord	SHIFT+Num 0
SearchQuick	CTRL+SHIFT+F
SelectionCaseCycle	SHIFT+F3
SelectionComment	/
SelectionEmbedFDEF	SHIFT+F4
SelectionEmbedParens	SHIFT+0
SelectionEmbedWaitCursor	CTRL+T
SelectionEmbedWaitBlock	CTRL+W
SelectionIndent	Tab
SelectionUnindent	SHIFT+Tab
ShapeNew	CTRL+ALT+Z
VariableNew	CTRL+SHIFT+V

Figure 1 – Shortcut Reference plug-in



Figure 2 – Palette Selector plug-in


```

// CodeRush PlugIn:
TPaletteSelectorPlugIn = class(TCodeRushStandardPlugIn)
// Empty body
end;

// ...

procedure TPaletteSelector.CodeRushStandardModuleCreate(Sender:
TObject);
begin
  TabControl := TTabControl (
    TwinControl (Application.MainForm.FindComponent
('PaletteBar')).Controls [0]);
  PaletteMenu := TabControl.PopupMenu;
  // Intercept the OnPopup event
  OldPopupEvent := PaletteMenu.OnPopup;
  PaletteMenu.OnPopup := PopupIntercept;
  PageMenu := TMenuItem.Create (Self);
  PageMenu.Caption := 'Page';
  PaletteMenu.Items.Add (PageMenu);
end;

procedure TPaletteSelector.ClickPageItem (Sender: TObject);

function StripAmpersand (const Str: String): String;
var
  Idx: Integer;
begin
  Result := '';
  for Idx := 1 to Length (Str) do
    if Str [Idx] <> '&' then Result := Result + Str [Idx];
  end;

begin { TPaletteSelector.ClickPageItem }
  TabControl.TabIndex := TabControl.Tabs.IndexOf
(StripAmpersand (TMenuItem (Sender).Caption));
  TabControl.OnChange (TabControl);
end;

procedure TPaletteSelector.PopupIntercept (Sender: TObject);
var
  Idx: Integer;
  Item: TMenuItem;
  ItemNames: TStringList;
begin
  // Call old popup event first so IDE can do its stuff...
  OldPopupEvent (PaletteMenu);

  // Flush out existing entries...
  for Idx := PageMenu.Count - 1 downto 0 do
    PageMenu.Delete (Idx);

  // Now add the page names as submenu items...
  // But need a temporary stringlist to sort the items...
  ItemNames := TStringList.Create;
  try
    ItemNames.Sorted := True;
    for Idx := 0 to TabControl.Tabs.Count - 1 do
      ItemNames.Add (TabControl.Tabs [Idx]);
    for Idx := 0 to ItemNames.Count - 1 do begin
      Item := TMenuItem.Create (PageMenu);
      Item.Caption := ItemNames [Idx];
      Item.Checked :=
        Item.Caption = TabControl.Tabs [TabControl.TabIndex];
      Item.OnClick := ClickPageItem;
      // Make a two-column menu
      if Idx = (ItemNames.Count + 1) div 2 then
        Item.Break := mbBarBreak;
      PageMenu.Add (Item);
    end;
  finally
    ItemNames.Free;
  end;
end;

procedure TPaletteSelector.CodeRushStandardModuleDestroy(Sender:
TObject);
begin
  PaletteMenu.OnPopup := OldPopupEvent;
end;

```

Listing 2 continued

mind that what's 'design-time' for the application developer is 'run-time' as far as the IDE is concerned! Therefore, when you see a reference to the Application object inside this first line of code, it's actually referring to the IDE application. In the same way, Application.MainForm refers to the main IDE window – the narrow, horizontal bar that contains the palette and program menu.

Having obtained a reference to the Component Palette's tab control, the plug-in next retrieves a reference to the popup menu associated with tab control. Rather than using the (frankly, cumbersome and clunky) 'Open Tools API' that Borland provides, we can work directly

What else is new?

Although the primary purpose of this article has been to get you enthusiastic about writing CodeRush plug-ins, it's also worth mentioning some of the other goodies in CodeRush 5. For starters, the Pro version now sports built-in diagramming support, making it possible to embed flowcharts, UML diagrams and other design documentation right into your source code. In practice, the source code text doesn't *really* get altered at all (it's still just a text file) but CodeRush uses some IDE magic to draw diagram elements into the code editor window. Diagrams are invisible to the compiler – just as well!

The very latest version of CodeRush (5.03f) will allow you to create macros consisting of a sequence of keystrokes, button presses and CodeRush commands, which can be very useful for automating tedious or repetitive tasks. CodeRush also traps exceptions that occur within the IDE, making it possible to invoke an optional 'Automatic Crash Protection' feature that saves modified source files to disk before doing anything else, thus protecting your work. In case you're worried about garbage getting written over your source code, the files are written as separate files. I found CodeRush to be very stable (much more so than its predecessors) and you're not likely to need this unless you're using Windows 95/98 – CodeRush in conjunction with Delphi 5 consumes a fair chunk of system resources. For those times when you don't want to use CodeRush, the Shift key can now be pressed down while Delphi is loading, and this will pop up a small dialog allowing you to disable CodeRush for that particular session.

with this menu just as if this were ordinary application programming. In fact it is; as I said, the IDE *is* the application! We create a new TMenuItem, set its caption string to 'Page' and add this item to the tab control's popup menu. Easy peasy!

However, there's one little problem here. At OnCreate time, we could walk the list of pages associated with the tab control and build a menu structure corresponding to the palette page names that are available. But if we did that, the palette might get rearranged before our menu is displayed, meaning that we'd be out of sync with reality. Unfortunately, CodeRush doesn't provide a 'Warning – the palette has changed!' event, and therefore a better solution is to build our menu of page names immediately before the popup menu is displayed. The usual way of doing this would be to make use of the OnPopup event associated with popup menus. But here we run into another problem – the IDE has already grabbed this event for its own use, presumably in order to check/uncheck the 'Show Hints' menu item.

Déjà vu for old TSR hackers?

How can we make use of the OnPopup event if the IDE has already grabbed it? The answer, of course, is that time-honoured trick of MS-DOS TSR writers, the daisy chain. We effectively grab the OnPopupEvent, pointing it at our own routine, PopupIntercept. Within the PopupIntercept routine, we can pass control on to the *original* OnPopup event handler that was installed by the IDE itself, and do any dynamic menu creation that we need.

Yes, I know. Wonderful though this trick is, it suffers from the same disadvantage as the old TSR interrupt chaining technique. If some other plug-in comes along and grabs the Component Palette tab control's OnPopup event handler after we've installed our daisy chain, then things can go pear-shaped. The bottom line is that I was here first, so go find yourself another event to hook!

Inside PopupIntercept, the old OnPopup event gets called first, and we then rebuild the PageMenu submenu tree from scratch, tak-

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```

unit IncDec;
interface

// uses omitted

type
  TIncrementDecrement = class(TCodeRushStandardModule)
  procedure SelectionIncrementExecute(Sender: TObject;
    parameters: String);
  procedure SelectionDecrementExecute(Sender: TObject;
    parameters: String);
  private
    { Private declarations }
  procedure InsertIncDec (const Command: String);
  end;

  // CodeRush PlugIn:
  TIncrementDecrementPlugIn = class(TCodeRushStandardPlugIn)
  // Empty body
  end;

//...

procedure TIncrementDecrement.InsertIncDec (const Command:
String);
var
  Selection: TStringList;
  lineNumber, column: Integer;
begin
  if Assigned (CodeRush) then begin
    Selection := CodeRush.GetSelectedText (False, True);
    if Assigned (Selection) and (Selection.Count = 1) then
    begin
      Selection [0] := Command + Selection [0] + ',';
      CodeRush.SetSelectedText (Selection, False);
      // Will wants the caret immediately after the
      // comma.Grow!
      CodeRush.GetCaretPosition (lineNumber, column);
      CodeRush.SetCaretPosition (lineNumber, column - 1);
    end;
  end;
end;

procedure TIncrementDecrement.SelectionIncrementExecute(Sender:
TObject; parameters: String);
begin
  InsertIncDec ('Inc ');
end;

procedure TIncrementDecrement.SelectionDecrementExecute(Sender:
TObject; parameters: String);
begin
  InsertIncDec ('Dec ');
end;

```

Listing 3 - Increment and decrement functionality.

ing care to remove any old entries first. You'll notice that the code first copies all the page names into a sorted list, and then uses the sorted list to create the menu tree. You almost certainly won't have your palette pages arranged in alphabetical order, but you almost certainly will want the menu items to appear alphabetically. Finally, as an added bit of niceness, at very little cost, you'll notice that I've split the menu into two columns. This is important if there are a large number of pages. If the popup menu exceeded the height of the screen, and we ended up having to scroll it vertically, it would defeat the object of the exercise.

Finally notice that the `OnClick` handler for each menu item is pointed at the `ClickPageItem` handler. Within the `ClickPageItem` handler, we simply retrieve the caption of the clicked menu item, using this to set the `TabIndex` property of the tab control. It's also necessary call the `OnChange` handler of the tab control, which notifies the IDE to update the list of displayed component icons.

Incidentally, you might be puzzled by the need for the `StripAmpersand` routine that strips any '&' characters from the menu item caption string. After all, we didn't put any ampersand characters into those menu captions, so why should there be any there now? Well, if you're familiar with the many new goodies in Delphi 5, you'll know about the `AutoHotKeys` property associated with popup menus. This means that the Delphi runtime library automatically adds hotkey assignments (ampersands to you and me!) to the menu items before the popup menu appears. If we didn't check for and remove those hot

keys, then we wouldn't get a match when searching the tab control for a matching page name.

Sad Old Ex-Editor suffers C++ envy shock

As a final example of CodeRush plug-ins, Listing 3 contains the source code for another Standard plug-in, which I wrote to humour one Will Watts, fellow Delphi-fan and ex-editor of this magazine. He wanted to prove to C++ programmers that Delphi could also increment/decrement a variable with just a couple of keystrokes similar to the ++ and -- operators in C++. Hmmmm...

The basic idea is that you select an identifier such as `Wombat` in the Delphi editor and then hit the keystroke of your choice to invoke either of these custom commands. I used Shift + and Shift -. The `IncDec` plug-in will then replace `Wombat` with

```
Inc (Wombat, |)
```

or

```
Dec (Wombat, |)
```

In both cases, the vertical bar shows the position of the cursor after the command has executed. Of the three plug-ins covered here, this is the simplest. There's no form and no hacking of the IDE internals; everything is done through CodeRush methods that allow you to retrieve and modify the code editor text. As you'll see from the code, execution of the two commands simply results in a call to one of the two `XXXExecute` methods (where `XXX` is the command name). This, in turn, results in a call to the internal `InsertIncDec` method, which is passed the prefix for the command, either 'Inc (' or 'Dec ('.

Finally, the `InsertIncDec` routine uses the CodeRush `GetSelectedText` method to retrieve an instance of a string-list variable that contains all the text selected in the current text editor window. Note carefully that we don't create this `TStringList` variable, and we therefore don't release it either! The code editor text is manipulated simply by altering the line of selected text and then calling `SetSelectedText` to write the modified text back to the code editor. As a final sop to Mr Watts, the editor's caret position is moved back one position such that the insertion caret is position ready to add an increment value as second parameter to the `Inc/Dec` operation. If you wanted, you might like to try extending this plug-in by adding a couple of additional commands that do a simple 'increment by 1', 'decrement by 1', etc.

Ease of extension

I hope the simple examples presented here will have got across how easy it is to extend the Delphi IDE using CodeRush plug-ins. As mentioned earlier, complete source code for these plug-ins will be available from EXE OnLine and the EXE conference on CIX. If you want to try CodeRush (and we strongly suggest you should), you can download a trial version from the Eagle Software website. CodeRush 5.0 Professional costs \$399 and the Standard edition can be had for \$199, the main difference being that the Pro version allows you to create and edit diagrams (see *What else is new?*).

Dave Jewell is a freelance consultant, programmer and technical author specialising in low-level systems programming under Windows and DOS. He is the author of 'Instant Delphi' published by Wrox Press. You can contact Dave at djewell@cix.compulink.co.uk.

The code for this article is available on EXE OnLine and via ftp at ftp://ftp.exe.co.uk/pub/exestuff/200002_CodeRush.

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Can our Sales People call you?

Alex Telford is an ex-C programmer who returned to the profession to discover that, while he was away, Microsoft had built something called MFC. Here are his early struggles, with tips for those who must follow in his footsteps.

MFC for non-believers

These are the experiences of a quiet woodsman – ie a ‘traditional’ C programmer – who has penetrated some short distance into the huge forest called the MFC, and set up a base camp in a clearing. From here, I have made excursions deeper into the forest, sometimes successful, but too often returning scratched, weary, and dispirited to the safety of camp. ‘Camp’ in this context is an MFC project – `apps.exe` – that is a condensation of those areas of MFC development that I have tamed. The `apps.exe` (available from EXE OnLine) is an SDI (Single Document Interface) MFC project with support for developers who are used to ‘console’-style programming, ready-to-use graphics functions, and C-style text file I/O. It is also an application stub for Rapid Application Development.

Natural progression

History has made MFC idiosyncratic. The whole structure of Windows is still imbued by the parsimony of memory and processor power that restricted earlier machines. Windows was not born a pre-emptive, interrupt driven, real-time operating system like those found on contemporary minicomputers at the time – RT11 and RSX11 on the DEC machines, for example. Windows was, and is, based on a message queue running in a single thread – this is at the heart of the Windows API. The MFC is a C++ wrapper around this API.

MFC restricts the number of ways a task can be performed. This is in contrast to the traditional C programming style where the programmer starts with an empty `main` and then fills it with code that is natural to the programmer’s style. With the Windows 1.0 API, C programmers felt comfortable – there was a `main`, the message processing loop was visible, and C functions were written to do the work in the customary way.

When I was studying development for Windows using the MFC, I was puzzled by the presence of books by respected authors – Petzold for example – who shunned development via the MFC and were still sticking to the C language and the API. Because of my time away from programming I missed the natural progression of my skill set, and never had the opportunity to program for Windows using the C-style API. Looking back from my present perspective, I’m thankful that I missed this phase. Because of its history, an MFC developer must have a fair knowledge of the old API – the MFC class methods ultimately call a routine embedded in the API. But I see now that had I been able to create Windows programs using the API, the incentive to persevere with the MFC route would have been lacking. And incentive is needed in spades!



MFC documentation

A problem I hit early on is the lack of a single source of documentation for beginners. There is a lack of a detailed discussion of the application model assumed by the MFC system. I expected to be able to read about the philosophy and thinking that gave rise within Microsoft to the core nature of typical MFC projects. Indeed, many decisions are made in advance outside the control of the programmer using the MFC. There is an extensive help system of course, but it is an ocean of reference material with not enough higher level design advice or suggestions. You have to know what to search for in the help system, and there are very few synonyms allowed – you must get the right keyword, no other word gets to the right section.

While learning other, earlier languages, many programmers found that the sample code given by the tutorial system was rich enough to provide a good starting point for their own projects. I did not find this to be true of the code provided with the MFC development suites. The samples seemed to me strangely skewed in some indefinable fashion – as if they had been created too early in the MFC design process, before the application model had been fully finalised. I was looking for a canonical single document-view architecture project, but found ‘Scribble’ not quite right – it seemed out of date.

The document-view architecture is also, very probably, a stumbling block for many programmers. Nearly all the books on MFC development go to some length to explain it, but they all make the mistake of plunging straight into the mechanics of it without explaining *why* we need such an architecture. I have had to reverse-engineer for myself the design thinking within Microsoft during the first creation of the MFC suite.

The application model

Here is the MFC application model that I’ve worked out. All Windows programs should behave mostly the same. Each will have a standard core set of options on a menu bar and there will be a sub-window or client area for the application’s text or graphics. The application’s main window can be full screen, minimised or iconised. Windows will send a message to the application, which must redraw its client area each time the application window changes size. This is the reason for the `OnDraw` function. The application will keep all the variables and memory defining its current state in one structure – in the MFC Document class (`CAppDoc`). A system for saving all this data to disk in binary form will allow the users of the application to save their current work to a disk file. When users restart the application at a later time, they re-read the disk file and are back exactly at the point they left it (and saved it!). This is the thinking behind the *Serialisation* methodology, and why the Document has such an influence on the client window(s) of the application.

The problem with this model is that the disk files that result from it are binary and *specific to the application*. That is, you wind up with a proprietary file for your application if you follow the standard MFC defaults. A choice of that kind is probably natural to Microsoft: it makes it less likely that another developer will write an application that piggybacks on your software.

All is not lost. The great news about developing via the MFC is that you don’t have to accept the defaults. Remember that C is a subset of C++, so we can fallback upon the earlier technology and use the C-style file `open`, and read and write files in standard ASCII text form suitable for Notepad and all the other applications that can process text files. Unfortunately, we lose the most-recently-used-file technology that comes free if we stick to the MFC default file mechanism. (Some developers have found a way to hijack the MRU system for their

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text files, see Dave Jewell’s *Windows shell secrets: the MRU list*, EXE, February 99.) The standard Windows way to include our C-style text file `open` is to add Import and Export items to the file menu.

One last problem with development for event-driven systems in general, not specific to the MFC, is the loss of sequence of execution. A traditional program with a `main` typically starts execution after loading, initialises global variables, outputs a prompt to the user, executes an appropriate routine, then loops back to output another prompt. The programmer could feel that he or she was in charge of operations: the users had a choice of action from a limited set, making it easier for the programmer to predict all possible user behaviour and cater for it.

This simple state of affairs is lost with event-driven GUI systems – your program is more like an unsorted bag of routines where the programmer has to give up the idea that he or she has control of when any particular routine will be executed. The program’s response to a user clicking a button can no longer be followed in a linear fashion in the code. Execution in an event-driven world hops about from one module to another making maintenance more difficult.

In MFC development, the application framework decides which of your routines or functions will be called next. This application framework code is generated for the programmer; it is the master control and the programmer is at its mercy.

The strengths of MFC

If much of the above seems negative about the MFC, you may wonder why developers would bother to use it. There are three strong reasons. First, we get to use C++, not cleanly perhaps, but it is there in the background. Then there is Microsoft’s claim that ‘we use it before you do – Visual C++ is written in Visual C++’. Developers feel a sense of security when using the same tools as the manufacturer of the operating system supporting their application code. (For an alternative view, see *MFC free*, Letters, EXE, January 2000.) Lastly, the MFC suite is huge, powerful, and has excellent debug facilities.

Consider these few lines of code:

```
class CIntrView : public CView
{
public:
    ...
    CInternetSession* m_Session;
}
...
m_Session = new CInternetSession();
strcpy(m_cInetURL,
        "http://www.microsoft.com/visualc");
```


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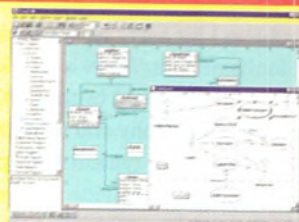
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```
CHttpFile* HTTPFile = (CHttpFile*)
m_Session->OpenURL(m_cInetURL);
pIdoc = m_CHTTPData;
m_uPageSize = HTTPFile->Read(pIdoc, 1024);
pIdoc += m_uPageSize; // next page of buffer
```

This is all a developer needs to present a login box to the user, call their ISP via dial-up networking, ask for the password, access Microsoft's visualc Web page, and then read the html code into a buffer. The developer can then parse the html code and display the result to the user, or store it to a file or database, whatever. Using my MFC application shell described below, I was able to produce a prototype new browser in about a week. But watch out for lightweight scripting systems that appear to do something similar, but may not allow the programmer access to the Web page html code, which is essential, mostly. There is a trend toward what I call 'slide-show' programming where 'controls' are called in a sequence but the programmer is unable to access any of the data content in the control. Definitely limiting.

During my early efforts to bend the MFC to my will, I encountered many reverses where the compiler would complain 'that function is in a class to which you have no access'. I ended up starting a text file that contained snippets of code that worked, fairly confident that

**There is a trend toward
'slide show' programming
where 'controls' are called
in a sequence but the
programmer is unable to
access any of the data
content in the control.**



understanding would follow familiarity. Gradually, I stopped bumping into the walls of the MFC maze. But the code-store became unsatisfactory – I needed something to speed up the production of each new project. After about 10 mini-prototypes, I noticed that there was a common core in all 10 projects. These were all Single Document Interface (SDI) projects. Each had a 'work-area' and some buttons outside this area as well as items added to the menu bar. Sometimes the work-area was text only and sometimes mainly graphics with text overlay. I started work on an 'application stub': a project from which all others could be derived by modification and deletion.

Figure 1 shows the main window of apps.exe. Unlike the raw application produced by the MFC wizard, this has some basic functions already working. This simple application is an intermediate step between the text-only capabilities of the console applications beloved by writers of books on introductory C++, and a full-blown MFC project with all the bells and whistles.

During construction its design turned towards the feature set that programmers had with console applications – for example, the ability to write out state/debug information to the console immediately. A text buffer is available where state information can be written at any stage. The contents of the buffer will appear in the work area if output is in text mode. A common requirement in text processing is accessing a field numerically within a line; the font is mono-spaced to facilitate this. Improving on the console, the text buffer may be paged back to see earlier data and be written out to a file for further analysis. But the major gain is access to graphics functions – an essential tool for today's applications.

The mode of action of apps.exe is very simple: an event – a mouse click on a button or on a menu item, or a timer event – causes flags to be set and data to be processed, and the result to be displayed in the work area. Some routines become quite lengthy; OnLButtonDown and OnDraw account for the majority of the code not provided by the wizard.

The current list of actions is: (1) Input an integer 'A', (2) Input an integer 'B', (3) Generate random text, (4) Alternate box colour, (5) Timer event, (6) Measure elapsed time, (7) Graphics, and (8) Input text and search.

When apps.exe reached this first stable feature set, I was surprised to find how much it resembled the C programs I used to write that had a main. Standard output is available from both the Document and View classes via functions such as PutTex(char*) and PutString(Cstring&). Items 1, 2 and 8 on the list of actions for apps.exe are keyboard-input mechanisms that do not require a dialog box. Item 3 reminds me of how to set up the random number generator using the date as a seed. A simple graphics function is illustrated in item 4, using a flag to set the workbox background

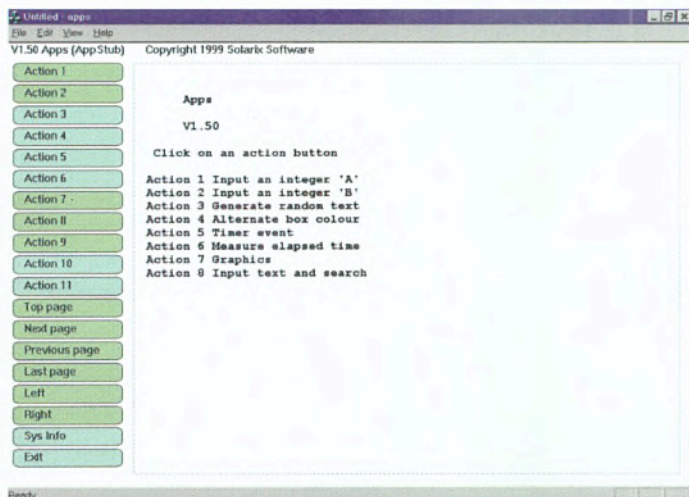


Figure 1 - The Application Stub apps.exe.

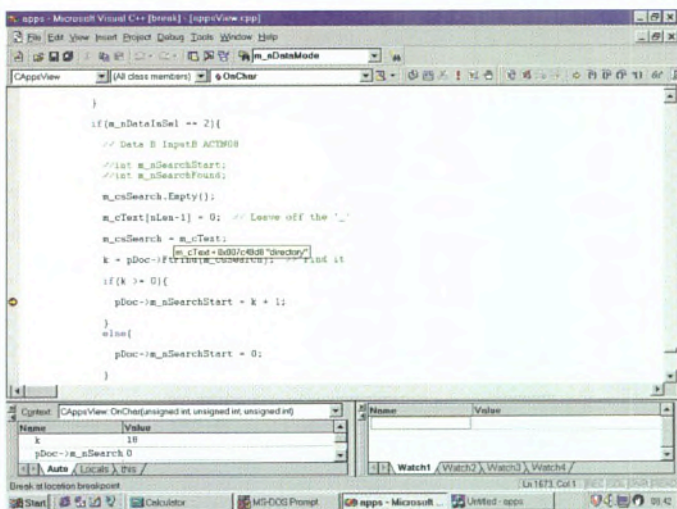
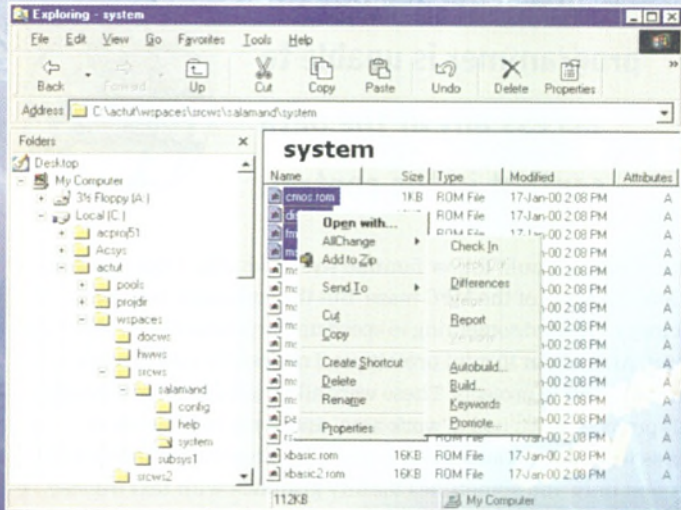


Figure 2 - The MFC IDE has excellent delay facilities.

Configuration Management The Way You Wanted It!



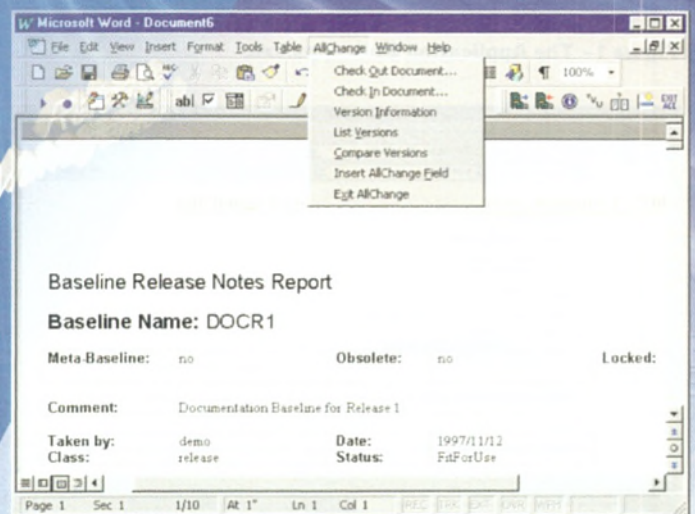
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colour. Items 5 and 6 demonstrate a Timer to initiate events at one second intervals and how to use `StartClock` and `GetElapsedTime`, which use the C struct `timeb` for millisecond time measurement. Drawing lines and filled rectangles via item 7 introduces the MFC methods for accessing the GDI functions. Left-clicking in the work-box invokes a set of cross-hairs – a precursor of graphics editing. Item 8 prompts the user for a text string, searches for it in the internal text file and, if found, displays that section of the file where the word first occurs with the line highlighted with colour.

'Sys Info' is used to record useful debug data in the internal text buffer that can be written out to a file: use File, Export on the menu bar. The internal text buffer is examined using the buttons Top page, Next page, Previous page and Last page. Long lines can be examined using Left and Right. Some buttons have no functions yet assigned; in completed prototypes these unassigned buttons can be made not to display by setting the appropriate flag.

An item is in the list because I found I was coding something similar in more than one project. Other programmers will have other interests – these can be added to the code files, extending the functions within `apps.exe`.

It will be apparent that `apps.exe` is distinctly 'retro'; this is intentional. The climb from the console applications in the books teaching C++ to mature projects developed with the MFC is too steep, a sheer wall with few handholds for the novice. The `apps.exe` is a secure, spacious ledge more than halfway up the cliff. It is possible because within the C++ MFC suite resides a general purpose C and C++ programming language with all the basic text and graph-

**It will be apparent that
apps.exe is distinctly
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applications in the books to
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ics primitives readily available. It also shows that you don't *have* to use Microsoft's controls – the button set in `apps.exe` is custom coded. You can be free about classes, too – whether or when to make a feature into an object is under the programmer's control. The text buffer started out as a class, then I de-classed it because I was adding functionality too often in the early stages. Just to keep the file set to a minimum, I brought it into the Document class. It could go back to a class now, probably. The button code in `apps.exe` is obviously a candidate for a class, but one of our own, with the functions *we* want. The MFC allows us to do this – an Open Source activity could grow up around this idea.

In tune with the idea of `apps.exe` being as simple as its functionality allows, the programmer need only examine or modify just five files: `APPSDOC.H` (3 KB), `APPSDOC.CPP` (14 KB), `APPSVIEW.H` (4 KB), `APPSVIEW.CPP` (33 KB), and `APPS.RC` (12 KB). If the `h` and `cpp` files are laid out in the MFC IDE in this order, then this is effectively the whole project in one 'file' – a big help with rapid application development. The only other file to be modified is `apps.rc`, which when opened allows access to the menu bar for adding more menu choices.

Your own developments

The EXE website, EXE OnLine, has a zip file with the MFC project files and a file `appshelp.txt` explaining how to add `apps.exe` to your project folders, and how to use the `apps` project as a base for the rapid development of other mini-projects. (You must have a valid copy of VC 5.0 or 6.0 to use this project.)

In the January 2000 issue of EXE, Dave Jewell rightly complains of the thinness of the C++ wrapper around the Windows API; his description of using a red, two-pixel wide pen hits home. The MFC code for this is too cumbersome. Perhaps `apps.exe` can serve as a core around which those of us that want to stick with the powerful, but flawed, MFC system can develop an Open Source approach to make our own C++ wrappers around the MFC wrappers around the Windows API. ■

After graduating in Physics in 1964, Alex Telford moved to London to support researchers in psychometric testing using the first minicomputers generally available. A transfer to a large Medical Research institute brought exposure to a Unix environment where they networked over 200 PCs. On retirement, he set up Solarix Software, which offers systems developed in C++ for Windows for a select group of clients. Contact a.telford@dia1.pipex.com.

The code for this article is available on EXE OnLine and via ftp at ftp://ftp.exe.co.uk/pub/exestuff/200002_mfc.

Further reading

The following are books that I have found useful for development via the MFC. (If you buy any of these, be sure to get the latest edition. There is a high turnover in this field, and some of these books may no longer be available.)

Inside Visual C++ David J. Kruglinski (ISBN 1572315652)

My bible when first learning the MFC. It gives a click-by-click guide to making applications via the MFC IDE. My edition has all the project code on a CD. (Now available as *Programming Visual C++* D.J. Kruglinski, G. Sheperd, and S. Wingo. This has the same content and is updated for VC 6.0.)

Microsoft Visual C++ Owners Manual

Beck Zaratian (ISBN 1572315105)

For building Visual C++ applications using Visual C++ from within Visual Studio.

MFC Developers Workshop Frank Crockett (ISBN 1572318597)

Has useful tips on more advanced use of the framework, for those with ~1 year experience.

Fast Track Visual C++ 6.0 Steve Holzner (ISBN: 0471312908)

Takes MFC from intermediate to advanced. Among other topics it covers Internet browser creation.

MFC Black Book Al Williams (ISBN 1576101851)

This gives a deeper understanding of the document-view architecture. Covers ActiveX, databases, Internet, and multithreading.

Microsoft Visual C++ Run-Time Library Reference, Volume 4

This is the volume that covers the runtime C library functions, a useful reminder in paper form: C-style string, file, math, etc.

Programming Windows 95

Charles Petzold, Paul Yao (ISBN 1556156766)

Not MFC, but an essential guide to the underlying Windows API.





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Macworld

4D "The product's strength lies in its ability to build applications with very little source code, making it very easy to maintain."
Point DBF

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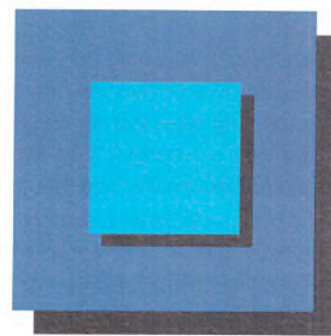
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Playing the Windows card

Windows from within a Sparc. Peter Collinson suspects the SunPCi card could make a great development platform for Windows products.



My method of avoiding any millennium problems on my Sun workstation was to upgrade it from a SparcStation II running Solaris 2.6 to a Sun Ultra/10 running Solaris 7. The operating system should have been called Solaris 2.7, but they decided to drop the '2'. I suspect that Sun has been avoiding problems with releases numbered '4', which is where Berkeley became stuck, and '5' (or more properly roman 'V'), which is where AT&T ended up.

A larger problem was caused by my wife's Windows 3.1 machine, which had probably reached the end of its useful life as a bit of hardware anyway. The solution seemed to be to give her my Windows NT system, since she is running NT 4 at work. She reads mail on the Sun, so installing Hummingbird's Exceed X solved the keyboard and screen contention problems that we occasionally got into.

However, I've become used to being able to run various Windows tools as part of the daily grind, so my initial idea was to install another machine running Windows NT for me to use. Space in my office is pushed already, so simply fitting in another machine was likely to be difficult, but I thought that it was just about possible. However, a new solution presented itself as I was looking at what I wanted to buy to replace the SparcStation.

Sun makes a 'PC on a card' called the SunPCi, which plugs into the PCI bus that's the main system bus for Sun's Ultra/10 and Ultra/5 systems. The SunPCi is a co-processor, running Windows standalone but using the Sun's disks, screen, and keyboard. The price is very attractive: the basic unit is £350, which seems a snip when set against the £1,500 that you would probably need to pay for a reasonable standalone Wintel machine.

The system

The SunPCi uses an AMD K6-2 processor chip. The most recent versions of the card run at 440 MHz, although earlier releases were clocked at slower speeds. The board has a 512 KB cache and is supplied with 64 MB of memory. I decided to fill the other DIMM slot on the board, so my system has 128 MB. (You have to use matched pairs of DIMMs in the two slots, and the system will take up to 256 MB.)

The SunPCi comes with a SoundBlaster-compatible sound card, a USB connection, and an external SVGA video connection. You can

plug in an external monitor and run the system direct to its own screen (more about this later). An optional expansion 'plug-in' can carry parallel and serial connectors. The expansion connector occupies another PCI slot in the system box, which happens to be unused on my machine.

To start the system, you fire up the `sunpci` command. On first invocation, the command creates a new directory called `pc` in your home directory, and then creates a file that is the 'emulated' hard C: drive for the SunPCi. The new C: drive can be sized up to 2 GB. Optionally, you can add another emulated D: drive, which can be the same maximum size.

The code that provides the disk emulation in the host seems to create space-efficient files by using a `seek` system call followed by a `write` when placing data in these emulated disk files. Unix files are stored as tree structures of blocks, where each block is referenced by a pointer. If a disk block has never been written, then the pointer will be empty, and the file will not contain any allocated disk space for that block. As a result, the files containing the emulated drives grow and occupy space on the host as that space is needed. The files have a maximum size, but can occupy less physical disk space than their size indicates, because the file can contain 'holes', where no data has ever been written.

Unix operates quite happily with a file with 'holes'; a read on a hole returns a block of zeros. However, you do have to work hard to maintain the holes. If you use a standard copy program, like `cp`, `tar`, or any dump system, the target file will have its holes replaced by real blocks of zeros. The SunPCi release does contain a program `cpkd` that can be used to copy the disk image files and will maintain the holes.

However, the efficiency of storage degrades rapidly. I've made the mistake of defragmenting my Windows 95 emulated filesystem. The defragmentation code writes blocks into free space well above the active filesystem, which has made the emulated filesystem grow alarmingly in physical size. What is needed is a standard tool that knows about the FAT filesystem and can resize the emulated file, possibly by copying, to drop off any unused blocks. One approach may be to find some Windows-based disk tool that can write a known pattern into all the unused blocks on the filesystem, and then write a program to run on the host that copies and cleans the file.

Loading systems

To get going, then, you fire up the `sunpci` binary, and create an emulated file of reasonable proportions. You then find that a window on your screen pops up with what is a normal PC boot sequence, testing memory and showing a `C>` prompt. The bootstrap contains Caldera OpenDOS and some magic bits of code from Sun that allows the system to see the disks on the host machine and, more importantly, to see the CD-ROM.

You are expected to supply your own versions of Windows, and since I subscribe to MSDN, I have a goodly supply of systems to try. The documentation says that the code supports Windows 95, both the original release and the OEM 2 release. It also supports Windows NT 4.0, service release 4. I've successfully booted both these systems. Of course, with emulated drives you can have several available systems that can be run on the machine. Getting a Windows system up and running is always a time consuming and lengthy process, even when all goes well, and is not to be done lightly. Again, the emulated drives help, because you can take snapshots of the installation process so that you only have to backtrack so far.

I pushed my luck and tried other systems with no significant success. I failed to boot the Windows 98 system that I tried. I looked at the Windows 2000 release, or tried to, the CD simply caused the `sunpci` program to core dump. Incidentally, you can load systems from a floppy. When you start the system up it will boot from a floppy rather than the C: drive. Note that the Linux boot floppy runs, but that it will not load the initial system.

System hooks

The key to the operation of the system is an IPC (inter-process communication) link between the SunPCi and the control program running on the host. The SunPCi card doesn't have direct access to any of the resources on the host machine. Instead, it talks to the `sunpci` control program to make it do things on its behalf.

Using the IPC, the raw DOS system that exists at bootstrap time can see portions of the Solaris filesystem, the floppy, and the CD-ROM. It can also write to the X11 window manager, which is no mean feat, and is done by polling the VGA hardware and sending 'dirty' lines to the host for placing into the X11 window. It can get data from the keyboard and mouse, although at this point the mouse has to be 'connected' to the SunPCi window, which can be slow.

Under Windows 95, the CD-ROM is accessed as a 'read-only remote disk'. The Sun mounts the CD-ROM using its normal mechanisms, and the SunPCi card sees it via the filesystem. This precludes booting from the CD, and doesn't cope with audio. In addition, I've found some Microsoft CDs that have UTF filenames, and the Sun cannot read them. Windows NT has its own CD-ROM driver and can deal with the CD on a block level, allowing autostart and all that kind of good stuff.

Nevertheless, the system allows you to have convincing bootstrap sequences for Windows 95 or NT. Actually, for Windows 95, I copied the setup files from the CD onto the emulated C: drive and installed from there. The Win NT bootstrap does this anyway. Once Windows is installed, you are provided with replacement drivers for various subsystems that slot into an appropriate part of the Windows system structure, talking IPC to the host and making things happen in the outside world.

The first of these modules provides a Windows Installable Filesystem (IFS) driver for the filesystem on your host machine. Actually, although this is documented, the fact that you can map portions of your host's filesystem tree as a 'drive' is not made very clear. It's also somewhat opaque that the IFS-based system is different from the filesystem access that's used to bootstrap the system, a filesystem

'redirector'. There are dire warnings about the bootstrap redirector, because it can only access 'traditional' MS-DOS names, and these warnings tend to put you off from seeking direct ways to access the host's filesystem.

However, you can access the host's filesystem by mapping drives. On Windows 95, if you map `\\usr\src\local` as some drive letter using Windows Explorer, then you can open the 'drive' and see the files that are stored in `/usr/src/local`. On Windows NT, you use a magic hostname for the same mapping: `\\localhost\usr\src\local`.

Networking

The second module using IPC is a version of `NDIS`. It allows the SunPCi card to have network access via the Ethernet card on the Sun. Network packets are transmitted into the host using IPC and are then fed into a `STREAMS` driver that pours them out onto the local network. The packets bypass the regular TCP/IP stack on the host and, for routing purposes, the host and the SunPCi need different IP addresses.

The current implementation of the host code means that we have the odd situation that the SunPCi and the host cannot 'see' each other on the network. The approved solution to this problem is to employ another machine and set up explicit routes. One route is established in the host to send packets destined for the SunPCi to that third machine, and one is created in the SunPCi to send packets addressed to its host directly to the third machine. This third machine is suddenly 'piggy in the middle', having packets thrown at it that are addressed to two other machines, and needs a pair of explicit routes to transmit the packets to their correct destination.

This workaround functions, but isn't perfect. First, if you don't have another machine, then you are sunk. I am using my Cisco router to do the job, which seemed the correct spot on my network to install the functionality. For a while this didn't work, because the router would see that the SunPCi and the host were on the same network and would pass on the routing 'helpfully' in an ICMP redirect message. It then dropped the routing from its internal tables. I could turn this feature off in the router interface, and did.

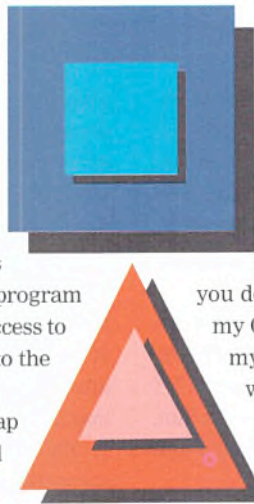
Second, using route redirection doesn't cope with broadcasts. A broadcast message from the SunPCi is not seen by its host and vice-versa. Lack of sensible broadcasting affects the SMB protocol that's used for file sharing, so you cannot host your WINS namespace manager on the host and expect the SunPCi to be able to use it.

Finally, there are problems with setting up the route on the SunPCi. You have to create a batch script containing a `net route` command that is called from the Setup folder. This sounds okay, but happens somewhat late in the system startup sequence. If you leave a window open to the host, where the window is accessing a shared filesystem over a regular network connection like Samba, then Windows 95 will lock up when you next start up the system. The Explorer application is trying to open a window to the remote host, and locks out the batch script that is trying helpfully to establish a route to that host.

None of these problems are insurmountable, but if the host of your SunPCi card also provides major network services like DNS, the WINS name service, or the NTP time service, then I anticipate problems at system startup.

System usability

As I said, I've tried both Windows 95 and Windows NT 4 on my SunPCi. Since the hardware is clocked at twice the speed of my original Windows NT machine, things ought to appear to be faster than the



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system I am used to, and they do. Windows NT is markedly more sluggish than Windows 95. Undoubtedly, software bloat is having an effect here. As a result, I've tended to use Windows 95.

One apparent funny is 'localisation'. The Windows system is seeing characters from your keyboard that are translated by the X11 and so are already 'localised'. I got one early system into a very odd state where it was re-translating the keystrokes from my UK keyboard back into some other (possibly US) keyboard layout and had to restart the system build. However, I consider that using the X11 key values is correct. It means that the same keystrokes generate the same characters in all the Windows on my X11 screen. Essentially, it allows me to remap the escape and backquote keys, and also turn off Caps Lock.

When the systems are running, graphical output destined for the host's monitor using X11 is obtained by intercepting calls to the GDI (Graphical Device Interface), and sending them via the IPC to the host for action. For this to work, the systems have to be well behaved and use the API. Windows 95 doesn't seem to be well behaved in spots. For example, the Plus! addons for coloured, animated cursors don't work. I've also seen other 'funnies' in some different applications.

The Windows NT screen driver is implemented differently from Windows 95, and it demands that applications are 'better behaved', so the SunPCi software that intercepts GDI calls is able to do a better job. With Windows 95 and NT, you can set the PC emulated screen on the workstation desktop to show either 256 or 16777216 (24-bit) colour with sizes up to 1280 x 1024 pixels. The latter is the size of my screen, so I tend to run it one 'click' down from that, at 1152 x 864.

If you want to run applications that make use of more facilities on the screen, perhaps with access to Direct X or the like, then you can switch to using the external monitor. First, you have to re-run the setup code to install the appropriate driver. Then you need to reboot the `sunpci` application giving it a `vga` switch to tell it that the system will be using an external monitor.

Actually, before switching drivers, it's a good idea to get into the BIOS settings on the SunPCi to tell the hardware to use a 4 MB display buffer. When you have done all this, output will be sent to the external monitor. The `sunpci` binary will still give you a window on the workstation monitor, and you have to place the mouse into this window and press `Meta-M` to force input focus to the SunPCi allowing it to receive keyboard and mouse events. This is the same technique that you use when initially loading Windows and is no great problem.

I've found that plugging in a 'real' large SVGA screen gives acceptable results. My Sun's monitor is dual ported so I can press a button on the front of the screen and see the output from the SunPCi. Actually, direct output on the Sun's monitor is not too nice at high resolutions because it uses interlacing and I get some ghosting. Output from the system looks better under X11.

One of the benefits as far as I am concerned is the ability to cut and paste between the applications running on the SunPCi and the X11 system running on the host. Sun provides a system application that sits in the Desktop 'tray' called Sun Clip that permits bi-directional movement of data between the two machines. The mechanism works fine for small bits of text. However, this program can be a source of system crashes; I've managed to take the `sunpci` binary out more than once by attempt-



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ing to copy some large piece of text from Microsoft Word. Once you have crashed the `sunpci` binary, then the SunPCi resets itself.

Sun also provides some hooks in the Common Desktop Environment on Solaris that allow you to open a file in the SunPCi. You can click on a Word document stored on your host and edit it using Word running on the SunPCi. These only work with Windows 95, and are another reason for me to run the system.

I haven't mentioned printing, because I have a HP network printer and have installed HP's JetAdmin on the SunPCi. This all worked and print jobs are emitted over the network to the printer. If you don't have this happy situation, but have a printer connected to your workstation or elsewhere on the network, then the software running on the SunPCi can give you access to the printer queues, sending print jobs to the host for queuing.

Verdict

All in all, I haven't regretted buying the SunPCi. It does seem to do all the tasks that I want to do on a PC system, which are mostly handling words or pictures. I wish that it was somewhat better documented; you have to spend time discovering how to set things up or how they work. There is no information at all on the BIOS settings, for example.

I suspect that it would make a great development platform for Windows or NT products, because you can easily switch between the various Microsoft systems and you can get data in and out with speed. In a large enterprise, it would be easy to establish one basic disk setup for all users, and then distribute it widely for personal use. There is

a need for Windows 98 and Windows 2000 support, and I am sure that this will materialise in time. Actually, I'd also like to be able to run Linux on the machine.

It seems early days with the product, although I understand that there are a great many systems in the field. When I said that the product seems somewhat new and flakey to a support engineer, he disagreed with me. However, the `sunpci` program does seem to crash rather a lot – although crashes happen considerably more frequently when you 'mess about' with the system.

In normal use, it's mostly robust, although I do always seem to have a recent core file hanging around. It crashes frequently when you are resetting the system, or the system is attempting to reset itself. Looking at these cores, it seems that there's some memory leak in the binary. It can crash unaccountably in some applications when you move bits of data around on the screen. Corel PhotoPaint under Windows 95 seems a culprit here. Using the SunPCi is not quite the same as having a standalone machine; there are interfacing problems.

That being said, I've found that the system is very usable. It costs you no space on the desktop, and it means that you don't have to worry about backing up your Windows or NT systems, because the SunPCi copes with that for you. Although, as I mentioned, there's a need for a program that will cut back the emulated filesystems to a size that matches their block use. However, all in all, I'd recommend it. ■

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Vendor lock-in



Francis Glassborow takes Sun Microsystems to task for its handling of Java, and warns about getting your pre- and post-increment operators in a twist.

One of the major motives for standards (be they 'de facto' or formal) is to help with portability. Ideally, when I write a piece of source code I should not be concerned with which compiler will compile it. In addition, in so far as is possible, I should write code that is independent of the platform on which it will run. That is a lesser objective because there may be platform specific facilities that I need (or just wish) to use.

The C and C++ standards provide a guarantee that by avoiding extensions offered by implementors, code will compile with any compliant compiler. The standards also specify where I can expect the behaviour of my executable to be fixed and where variations are allowed (implementation-defined and unspecified behaviour). The major objective is to help users avoid 'vendor lock-in'. Note that such avoidance suits almost everyone. It helps small companies compete by offering a better product that still compiles source code the way that it does with a competitor's product.

It is in the interest of the major supplier to own and control the standard or to ensure that its customers do not conform to an external standard. In the C and C++ world, various standards bodies own the standards. These organisations expect to make their money out of selling copies of standards and testing products for conformance. In many areas the result is that you choose a product on other criteria than whether it is compatible with what you already own. When did you last buy an electrical fitting because of its manufacturer? Do you actually take any notice of who makes the plugs and sockets for your domestic electrical supply? When you buy a music CD, do you first check whether it is compatible with your CD player?

Essentially, there is no vendor lock-in for these. Even where goods are more specific, you often find that a de facto standard allows others to offer spare parts, add-ons, etc. Where the product is protected by patent or copyright the owner may be able to make some profit from licensing third-party versions. Competition is on the basis of being able to offer a cheaper or somehow better alternative. Attempts at locking in customers often fail because they recognise the advantages of having multiple sources of supply. Even in the IT industries there is a very large measure of standardisation at the hardware level.

Lock-in as norm

However, at the user end of the IT spectrum vendor lock-in has become the norm. In the long run, this is bad news. It leads to a lack of competition and encourages any owner of a major sector to focus more on adding features that will encourage their customers to upgrade than providing a product that will compete with rivals on the basis of quality. Once I have a substantial code base that compiles with a particular vendor's product, the cost of moving to another compiler becomes too high and I am locked-in.

Manufacturers of hardware and operating systems compete to provide better environments for our applications. One reason that Java became so popular was its promise to be platform independent. The

cost of this independence was in performance. The extraordinary performance increase in hardware over the last five years has meant that the cost of using a virtual machine such as the JVM has become acceptable for very many types of application. Note that the important element is the JVM rather than Java as a programming language. The JVM threatens long established platforms because it allows the new platform to offer a wide range of applications even before developers actively support it. Owners of widely used operating systems must be tempted to subvert developers using Java so that the results will be locked to their OS (ring any bells?).

Java

Java was developed as a platform-independent product and over the last four years its owner – Sun Microsystems – has made a great song and dance about getting it standardised. It rejected the traditional path (eg that taken by AT&T when it sought C++ standardisation) as being too unwieldy and slow. It consumed a lot of time and other people's money by seeking to standardise Java by the PAS route, only to pull out at the last minute on the grounds that ISO's intellectual property rules were unacceptable. It then sought standardisation from ECMA. At the inaugural meeting of ECMA Technical Committee 41 it suddenly expressed doubts about ECMA's intellectual property rules, withheld documentation, and eventually withdrew.

There seems to be only one reasonable interpretation of its behaviour: it never wanted an independent standard for Java. Had it said that originally, history would have been different. Sun Microsystems wants total control of Java. This is just vendor lock-in in another form. Sun wants to control the suppliers of Java. It appears to want to be sole arbiters and absolute owners of Java. Fine, let them have the honesty to say so instead of dressing things up.

Always remember that one major motive for a standard is that by giving up the freedom to be different you gain the freedom to change your supplier. If you do not get the latter, then perhaps you should question the benefit of the former. I would love a standard virtual machine that allowed me to choose my hardware and development tools. But I am far from enamoured by one that is controlled by a single supplier. Proprietary products are great for the supplier but may not be so good for the customer.

A reader's critique

I am always thankful that some of my readers look very carefully at what I write and are reluctant to let me get away with even slight irregularities. Kevlin Henney, the very astute UK programming expert, took me to task for my December column where I wrote:

```
void destroy(T const * me) { me->~T(); me=new(me) T; }
```

First, there was that truly awful function name. Something like replacement would have been a far better name. However, more to the point was my ignoring C++'s greater requirement for type correctness. We all know that one consequence is that casting from `void *` to a



Unless we write a post-increment, the compiler will use the pre-increment version (originally C++

only provided facilities for a single user-defined increment operator).

specified pointer type requires an explicit cast. It is easy to forget that even when converting to a `void *` you also need to watch the cv qualification (`const`, `volatile` – in any combination, including neither). A good compiler will reject my code and, at the very least, I must use a cast. That just might add a little extra security. At least I will have to accept the blame if the object being replaced is actually in write-protected memory. The correct version (ie compilable even if dangerous) is:

```
void replacement (T const * me) {
    me -> ~T(); me = new( (void *) me) T;
}
```

Readers' C/C++ Programmers' Book of 1999

Sadly, I must report that this effort in getting reader participation was a complete failure. Exactly one reader sent in a list and two of his three nominations were actually 1998 books. I find it hard to believe that EXE subscribers do not read books so they must be too busy to reward good authors with a chance of some recognition.

Last month's problem

Last month I provided the following code as part of my 'solution' to the previous month's problem.

```
#include <iostream>
enum mytype {low=0, high=100};
mytype operator++(mytype & mt) {
    return static_cast<mytype>(mt==99)? mt=low : (mt++);
}
```

```
int main();
int i;
mytype mt = low;
std::cout << i++ << " " << i++ << '\n';
std::cout << ++mt << " " << ++mt << std::endl;
}
```

I then asserted that 'Both the lines of output invoke undefined behaviour or do they?' and for the following problem I asked:

Explain the way that the overload of `operator++()` for `mytype` works in the above, including the reason for the `static_cast<>`. Now consider my final assertion (about undefined behaviour). True or false?

The answer to the first part is fairly simple as long as you noted the many errors in my code. Clearly the intent is that the incrementing of a `mytype` value will be kept within the closed range zero to ninety-nine. Unfortunately, the code does not do this. The test should have been `(mt < high)`, even that presents a problem in that it assumes that the value is in range to start with, ie it is not negative. Writing code to check this is problematical because C++ does

not even require that such a value be valid (see this month's problem). We have to rewrite the conditional expression:

```
(mt < high) ? mt++ : mt = low;
```

Take another look. The `mt++` may look harmless until you think a little further. No, it is not a recursive call as such because it is a post-increment and the function we are writing is for a pre-increment. However, unless we write a post-increment, the compiler will use the pre-increment version (originally C++ only provided facilities for a single user-defined increment operator). We'd better replace `mt++` with `mt = mt+1`. However, unless we have provided an overloaded version of `operator+()` for `mytype` the compiler will first apply an implicit conversion from `mytype` to `int` and then add one to that.

At this stage, it will be unable to write the value back because the result will be an `int` and there is no implicit conversion from `int` to an `enum`. This is where we need a `static_cast`. Actually, in this context, I am quite happy with an old C++ function-style cast. I think it adequately expresses our intentions. It is one of the few places where I would use either a C-style or a C++ function-style cast. We can rewrite the `operator++()` for `mytype` as:

```
mytype operator++(mytype & mt) {
    return mt = ((mt < high) ? mytype(mt + 1) : low);
}
```

As both alternative evaluations of the conditional have the same type, no further conversions are required. You might like to think about whether the return should be by value or by reference. If you provide a post-increment you must return by value, but when we have a choice we generally prefer to return a reference. Should we here? Personally, I think not, because an `enum` value would not require any special storage and so we might as well leave the compiler freedom to do its best while preventing idiots from writing such code as:

```
++mt = mytype(42);
```

Now to that final assertion (regarding undefined behaviour). The answer is, of course, that the sequence points at entry and exit from the relevant increment functions protect the user-defined increment operations. This means that the results are unspecified but that you must get either '1 2' or '2 1' but the compiler has no excuse for setting fire to your room. On the other hand, the `int` case contains at least two levels of undefined behaviour. Note that not only can `i` be incremented twice without an intervening sequence point but `i` has never been initialised.

One lesson to learn from the above is just how careful you must be before accepting other people's code.

This month's problem

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

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

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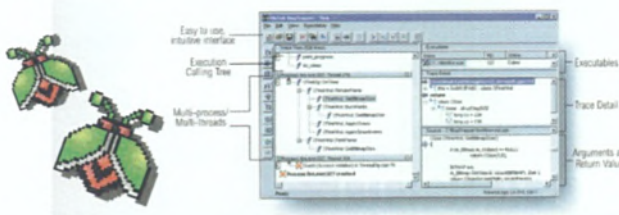
By Mutek Solutions

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Standardising builds



Having taken the lie of the land, our new Delphi columnist Philip Brown looks at standardising application builds.

Welcome to my first column for EXE. Hopefully, I'll be able to make it an interesting and stimulating series, exploring many facets of Delphi development. First, let me introduce myself. I'm an IT consultant and have been an active programmer for nearly two decades, just in time to catch the demise of the punched card and herald the advent of relatively accessible and cheap computing power. Over these years I have used many languages and it is my belief that Delphi is the best general-purpose Windows development tool currently available, with an excellent blend of powerful constructs, user interface tools, and support for strong object-oriented development techniques.

No silver bullets

It is a feature of our industry that many vendors try to sell us 'silver bullet' solutions to application development. We are continually bombarded with information attempting to persuade us that if we use this company's tool, that company's middleware, or the next company's database, then all of the issues around application development will disappear. Overnight, we will be able to produce complex systems on time and within budget, even in the presence of inadequate design documentation and changing user requirements. Bitter experience shows that there is no magic solution and it is down to us, as application designers and developers, to accept that in a world where clients have increasingly high expectations for ever more complex systems, we must continually strive to improve the quality of our work. These days, few applications live in isolation and they must interact with other systems in complex ways. Developing modern applications is getting harder rather than easier and it is wrong to suppose that any one approach provides the answer.

My specific interest, which I hope to explore in this and future columns, is to promote the development of *better* Delphi applications. Assume two independent programming teams are given the same brief to develop an application from a complete systems requirement document, and that both produce a bug-free program (note that we're already in the realms of software development fantasy). Can two different but functionally identical programs be separated in terms of quality? What makes one application better than another?

In practice, every single decision made during the development will have an impact on the quality of the program. User interface decisions will affect how user-friendly (or hostile) the program is. Apparently simple things like buttons with similar functions having the same name throughout the application can have a fundamental impact on how readily users will become familiar with the operation of the program. The choice of database, ease of installation, compatibility with other applications, even the layout of code within units, and variable naming conventions (or the absence of them) can all have a significant impact on the perceived or measurable concept of how *good* an application is. Developers and users will all form opinions as to the relative quality of a given application, without necessarily being able to pinpoint or justify *why* they have taken this view. Assessing the quality of a program encompasses virtually every single aspect and implementation decision made, and the aim of this column is to introduce and discuss ways by which the quality of delivered systems can be signifi-

cantly increased. This will cover such concepts as user interface style, data entry and validation, persistent storage of information, and a large amount of time will be spent discussing program architecture.

Studies have shown that the single biggest contribution over the last 20 years towards increasing program quality is the concept of data hiding. Object-orientation is the purest expression so far of this concept and this column will promote good OO techniques throughout. I will explore the construction of truly object-oriented systems and demonstrate how they lead to applications that are significantly quicker to develop and easier to maintain. Along the way I will challenge accepted ways of writing Delphi programs and demonstrate why alternative approaches are often better.

Consistency is king

If there is a single way of assessing the quality of a program, my definition would be 'Is it consistent?' Consistency can be applied to virtually all aspects of a program, and in nearly every case it is better to be more consistent than less. Consistent with what? Well, it depends on what is being evaluated. Consider the user interface: does each form appear screen centred, or are some left at design-time coordinates? Are all buttons the same size and do they appear in a consistent horizontal or vertical plane? Is every OK button set as the default for the form (and are any labelled 'Ok')? Do all forms respond correctly when the user changes Windows preferences for font size and colour schemes? For that matter, does the application look and behave like other Windows applications? Are toolbar icons the same as those in other applications that perform a similar function? Do they all have a ToolTip? Are similar components used for the same function throughout the application or is an eclectic mixture of edit boxes, masked edits, calendars, and date/time picker controls used for the input of dates?

A similar set of questions can be targeted at all other aspects of the system. Do all tables and fields have similar naming conventions? Is the source code indentation standard the same in every unit? In every case, it is preferable for these factors to be similar throughout the application. It matters much less exactly *which* standards have been chosen, as long as whichever standard is selected is ubiquitous (although often some choices are better than others, and these will be discussed).

Automating builds

One small, though very important, factor in considering consistency is ensuring that you always deliver the same product to your clients. Fundamental to this process is the concept of a *build*. This is defined as preparing all deliverables to a known state before shipping them to a client. For the most trivial applications the deliverable might be a single executable, but for more significant systems a build might include a number of executables, dynamic link libraries, help files, resource files, configuration information, database tables, and so on. How can we ensure that all of these files are created correctly in each build so that any changes made since the last build are reflected appropriately? Just loading the application into Delphi and forcing a Build All does not guarantee that you will always deliver an appropriate application suite.



Every application for public release should have a documented build process, preferably one that is completely automated. For simple applications, a simple batch file can be all that is required, but in extreme situations a dedicated environment may need to be provided.

In the Delphi world there are a number of options for automating most build processes: a batch file (DOS or Windows Script) that calls the Delphi command line compiler; using a make utility, or a custom application dedicated to building a specific suite of deliverables.

Inprise supplies a version of the venerable `make` with Delphi. The `make` utilities operate from a text file that describes the source files on which a target depends, and the command(s) required to compile them. In the early days of C programming, the use of such utilities was fundamental in improving the quality of released applications. However, one of the main benefits of `make` was that it provided a way to describe the interdependencies of C source files, something which the Delphi (Pascal) `uses` clause does well. Therefore, learning the somewhat arcane syntax of the files on which `make` depends has fewer benefits for Delphi programmers.

For many systems written with Delphi, a single batch file will suffice for a build process, containing all the commands necessary to ensure that a complete system is compiled. This should not only contain commands to compile resource files and Delphi projects, but also ensure that the version control database is complete (you *are* using source code control, aren't you?).

Listing 1 shows an example DOS batch script for compiling a particular project, showing some of the types of entries typical in a build process. The first part of the script ensures that all source code units have been checked back in to the version control database – a vital stage to prevent compiling a project while developers have not made their changes globally available. The version control system shown here is SourceSafe, but virtually all commercial-grade systems can be driven from the command line.

After ensuring all files have been checked in to the source code system, the complete source code is fetched and stored in a new directory tree on the machine performing the build. Obviously, to build the latest version of the program all of the latest files are required. An interesting point here is that it is recommended that if the machine

performing the build is also a developer's workstation, then a different directory tree is used to hold the source code rather than the one used by the developer. The reason for this is that the build will typically compile the application with no debug information and most optimisations on. If the directory path were shared with the development environment, then the programmer would need to remember to issue a Build All to avoid linking in units that would be difficult to debug.

Having fetched all of the latest source code, the application(s) should then be compiled. For Delphi projects, the command line version of the compiler called `dcc32` (found in the Delphi `bin` directory) should be used. This version of the compiler recognises many parameters to allow full control from the command line. Alternatively, a set of compiler options can be controlled from a configuration file (CFG) with the same name as the project itself, which is often a more visible way of controlling compilation. Note that Delphi 5 overwrites this file from the development environment: another good reason for keeping the build source directory separate from that for development. There is a particularly useful flag (`-E`) for `dcc32` that relocates the target file to a new directory, typically pointing to a new directory that will contain just the compiled files that constitute the build.

Of course, many systems consist of additional files such as resource files, help files, and so on. You can use whatever command line tools are appropriate to compile the target files. Again, Delphi provides a command line compiler for resource files: `brcc32`.

A DOS batch file or Windows Script may be adequate for smaller systems, but more complex ones requiring complex logic and control may benefit from having their own build process written as a custom application. Such applications may shell out to the command line versions of compiler tools, but often drive them through a COM interface that provides more flexibility and control. In either case, the concept of the build process is the same: to guarantee that all target files are compiled into a known and consistent state. You can build whatever measures you want into your build process, such as notifying the development or QA team by email that the build succeeded...

It is a good policy to perform a build at known and regular intervals. Knowing when a build is due allows the development team to work towards that goal and ensure that a consistent set of units are checked in to the version control suite. Unless your build process takes so long that it would be inappropriate, it is a good rule to prevent any work on the application until the build is complete. After the build has finished, it is usual to require all developers to get the latest version of all units to ensure that they do not work from out of date source code. The concept behind a build is that it does *not* form part of the development and testing process – all builds are expected to compile correctly without errors and generally without warnings. 'Breaking the build' by submitting code changes that then cause the build process to fail should be regarded as a heinous crime to be corrected at the earliest opportunity.

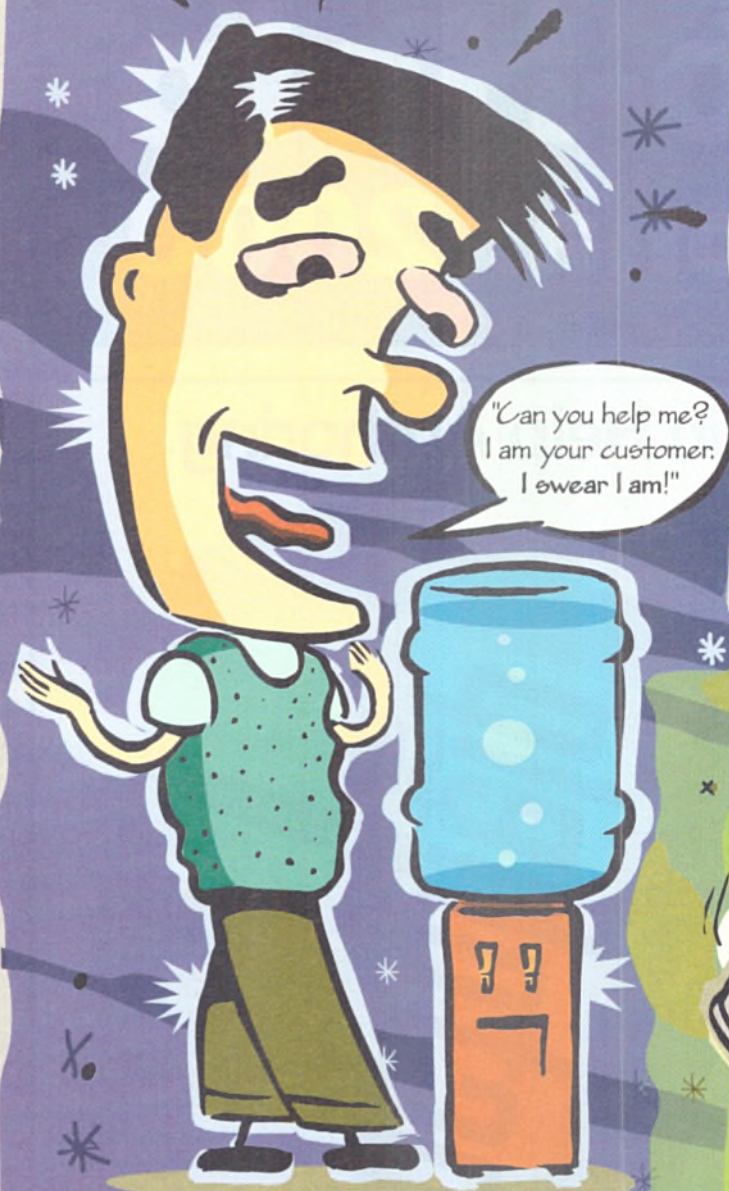
Version tracking

All applications written for general release should have their own automated build process, guaranteeing that a consistent set of deliverables is prepared every time a release is made. Next month, I'll look at value-added features that can be put into the build process to facilitate the tracking of multiple versions of programs co-existing 'in the wild'. ■

Philip Brown is a systems design consultant and active developer, presenter, and trainer. He'll promote the benefits of strong OO techniques to deliver better applications given any opportunity. You can contact him at phil@informatica.uk.com.

```
REM Set up source code control environment (SourceSafe)
PATH=%PATH%;C:\Progra~1\Micros~2\Vss\Win32
SET SSDIR=\\BuildServer\Archive
REM Ensure target destination directory is empty
DEL \\BuildServer\Target\*.
REM Check that all files are checked in
SS status -O- -R "$/MyProject"
IF ERRORLEVEL 1 GOTO CHECKED_OUT
REM Nothing checked out, extract all source code locally
C:
CD "C:\Development\Builds\MyProject"
DEL *.
SS get -I- -O- "$/MyProject" -R
REM Compile resource file
BRCC32 "C:\Development\Builds\MyProject\MyResources.rc"
IF ERRORLEVEL 1 GOTO FAIL
REM Compile application
DCC32 -E"\\BuildServer\Target"
"C:\Development\Builds\MyProject\MyProject.dpr"
IF ERRORLEVEL 1 GOTO FAIL
ECHO Build finished successfully!
GOTO FINISH
:CHECKED_OUT
ECHO Build aborted -
ECHO The following files are currently checked out:
SS status -R "$/MyProject"
GOTO FINISH
:FAIL
ECHO Build failed!
:FINISH
```

Listing 1 – A batch script to build a single executable and resource file.



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Despair. The final straw is the conglomerate's utter indifference to the future of database tools. Upon seeing that their vendor is now more interested in making numbers than it is in advancing technology and developing productive new toolsets, many DBAs simply surrender all hope.

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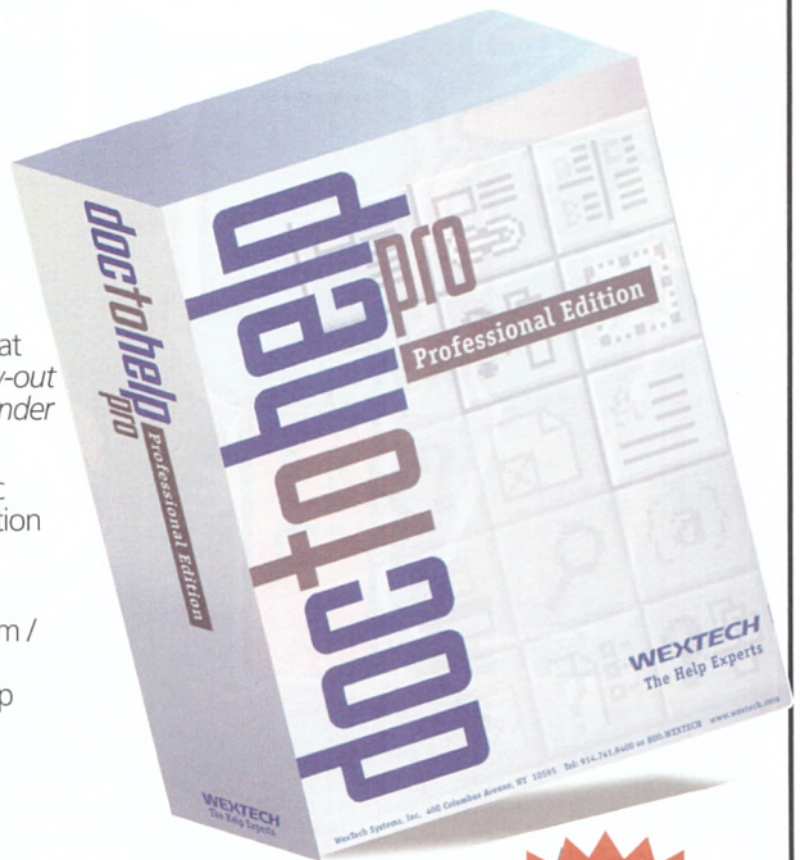
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Late binding — late danger

If profanity is a language that all programmers share, a prime Java cause can be the dangers of late binding. Lou Grinzo looks at Sun's Product Versioning



Specification and presents two strategies to ensure that all is present and correct.

I bet most Java programmers had the same reaction that I did when I was introduced to the language: relief and happiness over the designers having made so many obviously right decisions, such as fixed-size integers across platforms, strings as first-class types, and structured exception handling as a basic language facility. But I was also bothered by just a few things they did that would make life difficult for programmers out here in the unforgiving real world. For me, the most consistently annoying design detail involves Java's use of late binding. As all Windows users know far too well, there are some serious drawbacks to dynamic linkage, as manifested when programs disagree about the proper versions for all those DLLs scattered about our hard drives like so much binary confetti. Java aggravates the situation because its binding of classes is not just done at run-time, but at the first invocation of any given class. As a result, you and the users of your software can face some ugly situations because of a versioning or packaging error.

As with almost any interesting programming situation, this one is an outgrowth of a basic philosophical principle. In this case, the principle says that a program has only two options for any operation it actively allows you to initiate. It can complete the action as requested or it can tell you why it couldn't, leaving your data, itself, and the system in a safe and knowable state. A program crash doesn't even come close to meeting this requirement. (Clearly, things like the user unplugging the computer are outside the domain of control of a wordprocessor, which should not be blamed for losing changes since the most recent save operation was completed. But when a program invites you to click on a button or perform some tasks in parallel, such as printing in the background while continuing to edit a document, any failure to handle such user requests as mentioned above is a bug, period.)

This is a potentially serious problem for Java programs, particularly large or complicated applications that will be widely distributed, because it's possible for a program to run for a long time and consume a great deal of the user's resources (effort, time, and money) only to discover a necessary class isn't available or is the wrong version. I've seen this happen, and it's yet another reminder why the one language all programmers share (and most computer users, for that matter) is profanity.

Before readers and Sun boosters fire up their wordprocessors, let me say that I understand and appreciate that Java's design was heavily influenced by its intended use for networked programs and closed systems, like television-set-top boxes. When I'm writing a full-blown application with Java and have to struggle with late-binding issues, knowledge of the source of those design details is little comfort and no help. They're still obstacles that my program's users and I must conquer, regardless of their origin.

Luckily, Sun is aware of the dangers of late binding. See <http://java.sun.com/products/jdk/1.2/docs/guide/versioning/spec/VersioningSpecification.html> for information on its Product Ver-

sioning Specification (PVS). The PVS covers issues like how to determine the version, vendor, and specification level of the JVM that's running the program. The common element in retrieving most of these details is the use of the static method `java.lang.System.getProperties`. I strongly recommend that all Java programmers read this page on Sun's website, particularly the section *Problems of Evolution in Distributed Systems*, and think about how the scenarios it describes might apply to their programs and users. The page also addresses things like object serialisation and the specification level of the Java language itself.

The facilities mentioned on this page are an excellent first line of defence, but they're not enough. One possibility Sun didn't mention in its scenarios is programmer error. It's very easy to make a minor mistake in assembling a product's package or creating its installation program, one that could lie dormant until an unsuspecting user happens upon a little-used section of your code and is greeted by a screen of diagnostics triggered by a `NoClassDefFoundError` or a `NoSuchMethodError`, or worse, subtly incorrect results.

What's a programmer to do? There are essentially two different, but not mutually exclusive, approaches you can take to this problem. Both require more effort on your part than I wish were necessary, since it means few programmers will take these steps, thereby lowering the reliability of programs overall, as well as hurting Java's image.

The first solution is to check manually for the existence and version of your classes, and the other is to put your code into packages,

Special directories

Two little-known details in Java can make the installation of custom code slightly easier, particularly for widely distributed packages. First, in a typical Java 1.2.2 installation you have a directory named `c:\jdk1.2.2\jre`, which contains the subdirectories `bin` and `lib`. If you create a sibling directory to these two that is named 'classes' (eg `c:\jdk1.2.2\jre\classes`), you can use it to hold bare `class` files that will automatically be found by your running programs. Similarly, you can add a `jar` file to the directory `c:\jdk1.2.2\jre\lib\ext`, and it will be searched for packages and classes automatically.

Second, you can also use the `classes` directory with packages. If you place several classes into a package named `Bedrock`, you can then place the bare `class` files into a subdirectory with that same name beneath `classes` (eg `c:\jdk1.2.2\jre\classes\Bedrock`). These classes will be found, but obviously you can't use the `Package.getPackage` method and manifest technique, since there is no `jar` file and no manifest.

Use of these two special directories can relieve you of the need to set the `classpath` environment variable or specify a `classpath` on the Java command line, which eliminates one headache for programmers and users alike.



store them in jar files, and use a detailed jar manifest. I'll explain both options via sample code below.

The sample code

I've provided a pair of sample programs to demonstrate these techniques and give you a basis for experimenting. The file `bareclasses.zip` includes a main program (`start.java`) that calls methods in three other classes (`class0`, `class1`, and `class2`) so they can display some text. The interesting part of this example is in `start.java`, which uses a pair of methods to determine that the other classes really exist, they can be instantiated, and that they're the proper version. The version check is done with the help of the classes themselves. The `class0` simply has a `getVer` method, while `class1` and `class2` implement the `verClass` interface, which also has a `getVer` method. In both cases, `getVer` returns an integer that represents that class's version.

I use the convention that the returned integer is really three version codes concatenated into a single integer. The value 10500 should therefore be read as major version 1, minor version 5, and micro version 0. Obviously, you can make up and use whatever system you wish for encoding version numbers, but make sure you leave yourself enough room in the numbering scheme to represent minor changes and bug fixes without being forced to change the major version.

Why the difference in implementation between `class0` and the other two classes, you ask? As it turns out, there's a quirk in the use of the `classes` directory - if your class implements an interface, it won't be found if it's stored in that directory. I tried all permutations of placement of `class1.class`, `class2.class`, and `verClass.class`, and found that if even one of those three files were in `classes`, the program would fail. It has no trouble finding `class0.class` there, however.

You can use the 'bareclasses' sample by simply placing all the files into a single directory, or you can install `class0.class` into your `classes` directory.

The other sample program is in `jars.zip`, and it's a bit more involved thanks to its use of a package, jar file, and manifest to manage its classes. To use this sample, place the files `start.java` and `samplePackManifest.txt` into one directory, such as `c:\temp`, and then put `class1.java` and `class2.java` into a `samplePack` subdirectory of that one, eg `c:\temp\samplePack`. Compile the classes in `samplePack`, which will leave `class1.class` and `class2.class` in the `samplePack` directory. Make the parent of that directory the current one, and issue the command:

```
jar cvfm samplePack.jar samplePackManifest.txt
                        samplePack\*.class
```

Move the resulting `samplePack.jar` file to `c:\jdk1.2.2\jre\lib\ext`, then compile and run `start.java`, and everything should work fine. Like the first example and the interface quirk, this one also demonstrates a bizarre twist to Java's late binding. In `start.java` you'll see a couple of comments where I say that moving a `try/catch` block down in the program will make it fail. Apparently, `Package.getPackage` will only find a package if at least one class has already been retrieved from it, so placing it after the attempt to instantiate objects from `class1` and `class2` makes all the difference in the world.

When you run `start` from the second sample, it will retrieve the strings from the manifest file you added to the jar package and then

invoke the `sayHello` method in each of the classes. In a production program you would use the manifest strings to ensure that your program is using the package it expects.

Note that both samples look for all relevant classes before attempting to use them (beyond asking them for their version number), and trap all errors so that the program can refuse to run gracefully instead of unceremoniously crashing. This relates back to the philosophical point I mentioned earlier, and the need for programs not to paint themselves into a corner by beginning a long and complicated process that can't be reversed when they discover that a critical resource isn't available.

Recommendations

Make sure you thoroughly test the installation and use of any code before you distribute it. Once you start using packages, and jar files in particular, it's amazingly easy to forget that you have a package in your `ext` directory, as described above, and think that your installation works fine. In reality, your distribution package is missing that jar file or not installing it properly, and your program runs fine on your system because an old copy of the needed file just happens to be available.

Also try to remain aware of Java's quirks. The more you experiment with such things, the more undocumented surprises you'll uncover. I recommend using either the sample programs I've written or some of your own to explore how Java really works.

In particular, take the time to experiment with jar files if you haven't used them before, as Sun made them a bit on the fussy side. For example, to store several classes into a package named `Bedrock`, in the file `Bedrock.jar`, you can't simply compile the java files into `class` files and store them into a jar file from anywhere. You must place the `class` files in a directory called `Bedrock`, make the parent directory of `Bedrock` the current directory, and then issue the command:

```
jar cvf Bedrock.jar Bedrock\*.class
```

If you don't do this exactly as described, you'll still create a jar file, but it won't have the correct internal directory to work with your programs at runtime.

Don't get carried away. It's just as easy to become obsessed with such packaging and versioning details as it is to overlook them in the first place. You don't need to version check every single class of every single application or applet; good control over packaging plus decent testing will suffice in most cases. Still, you should have a daemon running in the back of your head at all times when you're designing and programming that's always on the lookout for places where your program and its user's data are particularly vulnerable.

Keep it simple. You can combine these techniques, and use both packages stored in jar files and `getVer` methods, and you can also use jar 'sealing', which requires that all classes from a package be taken from the same jar file. But my advice is to use the least infrastructure needed to provide the desired security. Any more than that can quickly turn into a future code maintenance problem. ■

Lou Grinzo has been working with and writing about desktop computers for more years than he'll publicly admit. He's currently focusing on cross-platform technologies, including Java, Linux, and XML. His website is <http://www.gizmoDrome.com> and you can email him at lou@gizmoDrome.com.

The code for this article is available on EXE OnLine and via ftp at ftp://ftp.exe.co.uk/pub/exestuff/200002_java. **EXE ONLINE**

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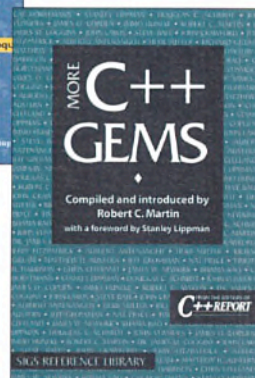
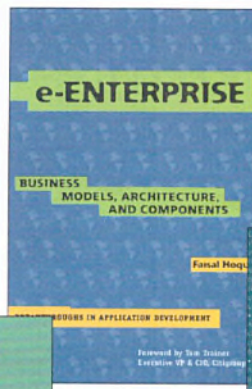
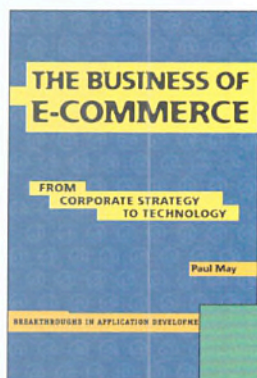
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The system tray. Jon Perkins takes it from the pending pile of topics. But not before covering the automatic and manual techniques for drag and drop.

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Drag and drop is, of course, concerned with the movement of data from one control to another. Visual Basic provides two ways to perform this operation, the *automatic* way and the *manual* way. The automatic way is very straightforward: no coding is required. This can be proven by pasting a RichTextBox onto a form in a Visual Basic project, setting the OLEDragMode and OLEDropMode properties to automatic, and running the project. Then try dragging some text from a Word document and you should see it all work as you would expect.

Manual mode

Manual mode gives you a greater degree of control, but requires that you write code for several of the events that are listed in Table 1. The sequence is:

1. Within the MouseDown event for the control that will be acting as the source, a call is made to the OLEDrag method.
2. The OLEDrag method fires the OLEStartDrag event, which looks like this:

```
<controlname>_OLEStartDrag(Data As DataObject, _
    AllowedEffects As Long)
```

We'll come back to the DataObject shortly, but the AllowedEffects parameter determines which operations are supported. You might wish to allow only a copy operation, or a move operation, or both. There is the option to disallow either operation if you need to.

3. As the user moves the mouse over a target control, the OLEDragOver event is fired. This provides the option of changing the AllowedEffects value if necessary. A similar event, OLEGiveFeedback, allows for the AllowedEffects to be altered. Both give you the opportunity to display custom cursors.
4. When the user finally releases the mouse button over a valid target the OLEDragDrop event is fired within the target control. At this point you can do whatever is necessary to tidy up the operation.
5. Finally, the OLECompleteDrag event is fired within the source control to inform it that the operation has completed.

DataObject

The DataObject object, whose properties and methods are shown in Table 2, is the means by which data is transferred between the source and the target controls. It is automatically created just before the OLEStartDrag event fires, and is passed around as a parameter between several of the events shown in Table 1. You would typically start to use DataObject in the OLEStartDrag event by calling the SetData method, which is defined as:

```
DataObject.SetData Value, Format
```

The Value that you supply can be pretty much whatever you want, including bitmaps and metafiles, but you need to specify the format in the second parameter. For example:

```
Private Sub Text1_OLEStartDrag(Data As DataObject, _
    AllowedEffects As Long)
    Data.SetData Text1.SelText, vbCFText
    AllowedEffects = vbDropEffectMove
End Sub
```

As the user moves the mouse over each candidate target control, the OLEDragOver event is fired. This gives you the opportunity to examine the nature of the data that is being dragged so that you can decide whether to accept it. Call the GetFormat method of the DataObject object and compare the result with the format of the current control. For instance, the image control supports drag and drop but of course it deals with bitmap data rather than text. If it identifies incoming data as being unsupported, it should deny the operation. This can be coded in simple terms as:

```
Private Sub Image1_OLEDragOver(Data As DataObject, _
    Effect As Long, Button As Integer, _
    Shift As Integer, X As Single, _
    Y As Single, State As Integer)

    ' Check that format is a bitmap, else disallow
    If Data.GetFormat(vbCFBitmap) Or _
        Data.GetFormat(vbCFDIB) Then
        Effect = vbDropEffectMove
    Else
        Effect = vbDropEffectNone
    End If
End Sub
```

Once the user finally releases the mouse button, we need to complete the operation. Because we have decided to manipulate the data manually, it is necessary to add it to the new control and, in the event of a move rather than a copy, also delete it from the source control.

Name	Source/target	Description
OLEStartDrag	Source	Fired in response to the OLEDrag method
OLEDragOver	Target	Occurs when a drag enters the area occupied by the target
OLEGiveFeedback	Source	Offers the facility to customise the drag icon feedback
OLEDragDrop	Target	Denotes the end of the drop operation for the target
OLESetData	Source	Fired in the source control when the OLEDragDrop event occurs in a target
OLECompleteDrag	Source	Denotes the end of the drop operation for the source

Table 1 – Standard OLE drag and drop events.

Drop right in



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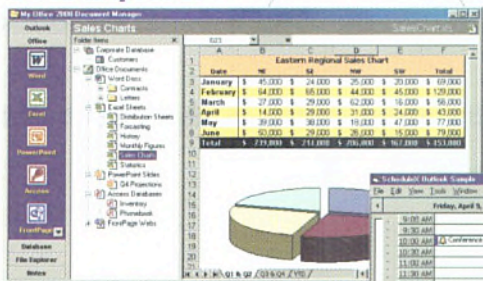
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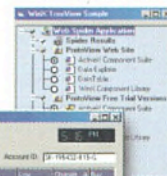
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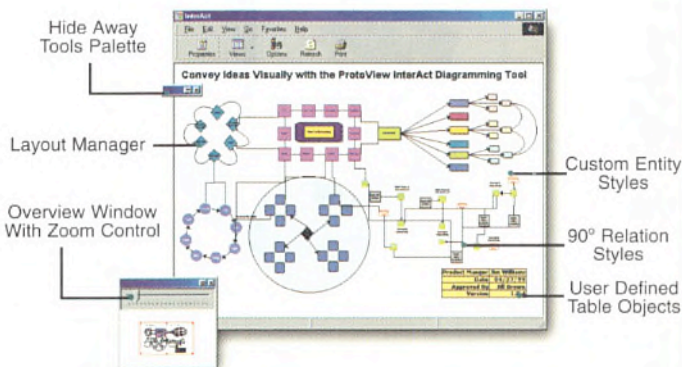
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Kent Beck's *Extreme Programming Explained* reviewed by Kevlin Henney.



In addition to being challenged by Brooks's Law ('Adding manpower to a late software project makes it later'), software development is seen as being bound to the exponential cost curve. How much does it cost to introduce a change into software? The stock answer is that it is cheap during analysis and rises throughout the cycle, sky rocketing by the time the code is in production. But what if this does not necessarily have to be the case? Extreme Programming (XP) is a code-centric and lightweight – but highly disciplined – development methodology that believes the curve can be flattened.

In *Extreme Programming Explained*, Kent Beck – well known within the Smalltalk and the patterns communities – outlines the values, principles, and practices of XP. The book is structured around three main sections plus appendices: *The Problem*, *The Solution*, and *Implementing XP*. It is well written and well structured. With around 30 chapters in under 200 pages, it delivers its questions and answers in thought-sized chunks.

It all flows from the idea that there are four variables in software development: cost, time, quality, and scope. These are related in a complex fashion, and the case put forward is that scope is the easiest to control and for which there is the simplest relationship to product. In no uncertain terms, quality should not be sacrificed – search your own experience and you can recognise this as a common first victim.

Four values are said to lie at the heart of XP: communication, simplicity, feedback, and courage. From these come the core XP principles: rapid feedback, incremental change, embracing change, assuming simplicity, and quality work. These are supported by secondary principles: teach learning as opposed to doctrine; make small initial investments; play to win as opposed to playing not to lose; follow concrete experiments rather than theory to validate decisions; open and honest communication rather than sulking and politicking; work with people's instincts and not against them; the willing acceptance of responsibility; local adaptation of practices; travel light rather than working with a baggage-heavy development approach; and honest measurement so you always know where you are.

The magic number four recurs again in the basic activities underpinning development: coding, testing, listening, and designing. From these activities follow the XP practices, which are based on the principles and are structured to reinforce each other:

- The planning game determines scope through user stories (essentially, Use Cases) for each iteration, where an iteration of the project is around three weeks. Importantly, business decisions are taken by business people and technical decisions by technical people.
- Small releases, which echoes the Open Source strategy of release early and often.
- A metaphor describes how the system works.
- Simple design ensures that designs are as minimal as they need to be to pass the tests that bound the scope.
- Testing is very much the key to the flexibility of XP, and no code is written without a test case first being written (where *written* refers to code rather than documentation).
- Refactoring is the route by which a design is evolved.

- Pair programming for all production code. Programmers pair for a few hours at most, not for life. XP is based on physical proximity of the development team, which is a notable contrast with Open Source development.
- Collective ownership of code means that anyone can change any part of the system.
- Continuous integration means that the system may be completely rebuilt many times a day, but that it is always up to date and working.
- Stipulating a 40-hour week as a development practice breaks away from the overtime culture, ensuring that developers are always at their most alert. Certainly there should never be more than two consecutive weeks of overtime.
- An on-site customer acts as part of the team, responsible for domain expertise and acceptance tests.
- Coding standards are defined by the team and are adhered to.

From this, you can see that XP is not just another rabid application development approach. It is presented as being rooted in human values and is tied down by some quite precise practices. The extensive use of version control, aggressive use of unit testing, close adherence to coding standards, and working with other people place it poles apart from less disciplined hacking. Through pair programming and refactoring, code is continuously refined and reviewed, and changing pairs means that everyone has familiarity with the system as a whole.

The book is a compelling read, which is surprising if you take a step back and consider that in essence it is a methodology book! The points it makes are at once both sensible and provocative. Whether or not you adopt XP (or feel the need to adopt it) is perhaps not the issue: what is important is that you will see software development from a refreshing perspective, and call into question the way you do things. ■



Book details

Title:	<i>Extreme Programming Explained: Embrace Change</i>
Author:	Kent Beck
Cover:	Paperback
Publisher:	Addison-Wesley
ISBN:	0-201-61641-6
Price:	£18.99
Pages:	200

Further surfing

What might be considered the main XP website, relocated from Ron Jeffries' original pages, contains a list of definitions and resources relating to XP. It includes a dialectic-style rationalisation of the XP practices:

<http://www.xprogramming.com>

The WikiWikiWeb is a connected and evolving set of pages; an interactive web, if you like. Not only does it demonstrate good use of hyperlinking, but it also contains a lot of useful dialogue and presentation from key individuals in the XP and patterns communities:

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

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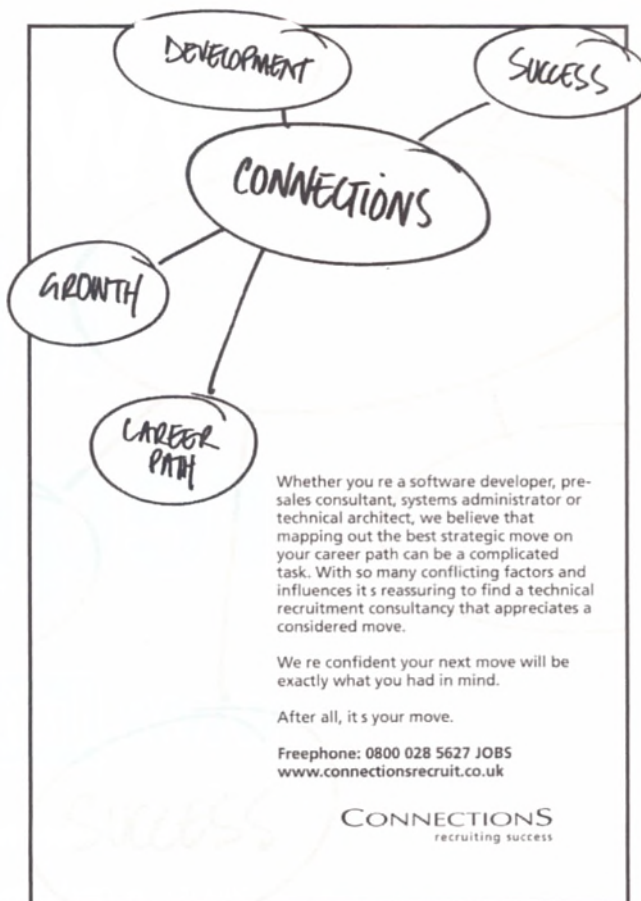
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JaCC 99 - the software developer's conference
ACCU (the Association of C and C++ Users) and EXE have put together a unique conference for all Java, C and C++ developers over four days at the world-famous Oxford Union, featuring expert speakers including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

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

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

Sending client data to the server

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

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

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



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Eric S. Raymond

This month we feature Eric S. Raymond, one of the major forces behind the Open Source movement. Best known for the essay 'The Cathedral and The Bazaar', he is a celebrated author, Linux hacker and general evangelist for the Open Source model of software development.



What was the first computer you worked on?

Worked on? Hmm...that would have been a PDP-10 minicomputer in 1976. The first computer I played on was a Univac 1108, in 1967.

What was the first computer language you worked in?

APL.

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

I list sixteen languages on my resume and have probably used half that many again. I'm no longer fluent in most of them, but could be within days if I needed to be – after your first dozen, it gets easier. For the last several years I've written mainly in C, Python, and Lisp.

What was the last program you wrote?

As opposed to one I'm still working on? That would be web2png, a Python program that converts websites from using GIFs to using PNGs.

What was the most difficult project you worked on?

It's hard to rank them that way. And anyway, you probably don't want a catalogue of the failures I've been involved in. Nobody writes software without accumulating at least a few, and they can be valuable learning experiences – but it's depressing to recall them.

Are the best software developers born or made?

A bit of both, I think. Designing software is like composing music or doing mathematics or pursuing any other rigorous art form; it takes both neurological talent and learned mental discipline. The proportions of these vary between software designers.

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

The one I *am* changing – the horribly counterproductive practice of locking up source code in a vault somewhere and never letting anyone but the original developers and a few maintainers from the same organisation see it. That prevention of a healthy peer-review process brought on our present software reliability problems. Only giving up on the destructive habit of source code secrecy will end them.

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

Learn some Linux. Microsoft's days are numbered, and you want to have an exit strategy ready.

What is your proudest accomplishment, within IT?

I don't know that I've ever been within 'IT' as the term is usually used (that is, for applications development in a business context). I'm an infrastructure-and-systems guy, more likely to be found building the tools that IT developers use than doing IT stuff myself.

That said, I guess what I'm proudest of within the technical ambit of programming is having substantial amounts of code (including large portions of a system library and several utilities) in every major Linux distribution now shipping.

What is your proudest accomplishment, outside of IT?

That's a tough one. The black belt in Tae Kwon Do? Learning to shoot a .45 semi pretty well? My three published books? Doing session work on two record albums? Hmm...maybe it was personally helping squash the *Communications Decency Act* back in 1996.

I think maybe my proudest accomplishment has been never giving in to the temptation to specialise too much. Years ago one of my favourite SF writers, Robert Heinlein, thundered 'Specialisation is for insects!'. You're interviewing me because I stuck to being a generalist, and was therefore able to bring cross-disciplinary insights to programming.

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

Theoretical mathematics or philosophy, maybe. Or I might be a jazz or rock musician. Or (in some alternate timeline where I wasn't born with cerebral palsy) a martial-arts teacher. I've done a bit of all of these and might have continued with any of them.

Commercial, shareware, freeware, Open Source?

I've been an open-source developer since 1981. I expect to be one for the rest of my life. Five years from now I no longer expect to be an exception.

How do you react to the flames of language wars?

With amusement, mostly. My current favourite is Python.

What is your favourite book?

I've read way too many books to have a favourite. My tastes run to hard SF, history, and science.

What is your favourite film?

My favourite recent film is *The Matrix*. Hey, I'm a hacker and a martial artist and a firearms fan – I had to love that film. Other films I remember with particular pleasure were *Grosse Pointe Blank*, *True Lies*, and (a bit further back) *The Last Wave*.

What is your favourite website?

I usually start surfing from www.kernelnotes.org.

What is your latest gizmo?

A Victorinox Cybertool I was given in Zurich after I did a talk at ETH. This is the Swiss Army Knife for computer hackers; you have to see some of the attachments to believe them – the hex driver with the built-in rack of Torx and Phillips and flat-blade bits that folds into the knife case is just wonderfully crazy. Whoever designed *that* is still giggling.

But the Cybertool, while cute, isn't a really *practical* gizmo. My best day-in-day-out gizmo is the Sony VAIO laptop I'm typing on now: 3.5 pounds of serious Linux machine with a 1024x768 display, 95%-size keyboard, and it's small enough to fit on an airline tray table. A real sanity-saver on long plane flights.

Anything else to add?

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Then buy a copy of my latest book, *The Cathedral and the Bazaar* (pretty much all of which is on my website), and give it to your boss. Your job conditions could improve dramatically as a result.

Next month: Kent Beck

Back to his roots

'Bill Gates... [announced] that he will step down as chief executive... Microsoft said Mr Gates would... take on a new role as its chief software architect. "I'm returning to what I love most – focusing on technology," Mr Gates said.' – Financial Times

Monday

There was a big meeting at 10am in the corner conference room with the glass walls. As usual there were the regular coders in the W2K non-laser, non-impact printer driver group (which is Kyle and me and a couple of temporary guys seconded from Office Applications) but also they had called in the H-P color ink-jet specialist people. This was cool, because I am dating a member of that team, specifically Katherine the code leader who is absolutely the Solar System expert in partying with hardware. She can completely solder a RS-232 nine-pin D-type in three minutes, including two flow control lines, with the soldering iron *unplugged and getting cold!!!* Also, she once nearly had an article published by MSJ: *Building enterprise calendaring applications for Windows CE using Outlook 2000 VBA's Object Oriented Transaction Extensions and COM+*, only it was rejected at the last minute because Marketing were de-emphasising the Windows CE Outlook 2000 product pending a new Exchange announcement.

Katherine and me sat next to each other, sharing a can of Tab, and of course this annoyed Kyle, who gets really jealous. He said:

'I hope you guys are having fun with your cute little canoodle, because as it happens we are looking to do some work here today.'

That made Katherine really mad, because she thinks that using the term 'guys' as a collective noun for 'people' is sexist. I could feel her grip the can real tight, and I was worried that she would crush it and I would get Tab on my Limited Edition 1992 'Death to Wesley Snipes!' T-shirt, so I pointed through the glass wall to the corridor and said:

'Wow! Look at that.'

And as luck would have it at that moment something worth looking at did happen. A squad of suits, eight or nine guys, came marching around the corner, in formation, and then they came into our room without knocking or anything and sort of spread out. And there in the middle was, was, was, I can hardly bear to type it... Bill.

And Bill looked around the room, as though we weren't there, and said, 'Yeah, I guess this will do', then turned around and swept out again, leaving two of his entourage behind. And one of these gorillas said, 'Ok nerds, beat it!' and Karl started to say 'But...' and then thought better of it.

Tuesday

Amazing mega news! Bill's moved in to the office next door!

I'm walking to my office via the slow route, the one which happens to take me past Katherine's cubicle, and I see that the corner conference room has been completely done out with executive furniture, and in there was... Bill! I try to sneak past, but he sees me and beckons me in.

He wants tech support. There I am giving Bill tech support! He is trying to use SourceSafe SP3 on a machine with the latest build of Millennium – anybody in the block could have told him that's not going to fly straight off – so I fix up the environment variables he needs and suggest he reboots. He does and it works, so I start to leave. But as I get to the door he looks up at me and says, 'I'll remember'.

Rushed back to our den to break the news to Karl, who then shows me a company-wide broadcast email that says Bill has stepped down as CEO to become 'chief software architect'. Katherine, who has stopped by our office to show me a freak bi-color M&M she had found, says:

'You'd think he'd be doing more high level stuff than installing SourceSafe. You'd think he'd be approving new ideas and changing designs and ordering people about.'

'He's trying to prove he's still got it, that's he's still an ace hacker. I reckon he's trying to get back to his days of writing a 2 KB BASIC interpreter in machine code,' said Karl.

Karl is a bit of a rebel – he is rumoured to dual-boot his home machine NT and Suse, a habit strictly proscribed after the Halloween débâcle – so we don't take his pronouncements too seriously. All the same...

Thursday

When I remember, I try to avoid going the slow route to the office now – it's getting too slow. Yesterday I was caught twice; once to change a screen driver in Windows 98, and once to help with a SCSI termination problem. Honestly, it's as bad as when I went home last Thanksgiving, and Dad kept me busy all day with this beat up old Pent II he'd bought in a Fry's sale.

But I did sneak past at lunchtime, and what Kath said was true: he was sat there, chin supported on hands, staring at his screen saver, the OpenGL perpendicular-pipes one. He looked pretty lonely. I tiptoed away.

Friday

Katherine came running into our office, absolutely white. Even Karl, who normally doesn't care much for her, noticed that something was wrong, and went as far as moving his precious pile of original, 1989 C 5.1 ring-bound manuals off the broken chair, so she could sit down.

What had happened was this. She had gone to Bill's office with the idea of trying to get him to endorse her new MSJ article proposal: *Frameworking Windows 2000 active kernel control objects securely across the Internet using ATL 4.0 and MTS*. Predictably she got caught for a tech support problem; the big shock was the problem itself. Bill had forgotten his password for SourceSafe.

Bill forgets passwords?!?!?

Anyway, they sat there for a bit, and tried a few obvious ones, but it was no soap. Then Katherine had said: 'Hey there's a guy in Plotters and other obsoletes called Gary who's really good at this kind of thing – he got into my personal Access database of Brazilian feminist crockery in ten seconds flat. Shall I go get him?' But Bill said he'd rather go and ask him personally, as it was a bit embarrassing. He left, and Katherine was alone in the office, and she'd had one, last, off-the-wall guess, and it had worked. And then she had taken off.

I asked: 'So what was the password, Katherine?'

She turned and looked me straight in the eye.

'Rosebud', she said.

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Project: Robot Corr. Tools (ONS, Com			
Defect Statistics	Priority 1	Priority 2	Priority 3
Open Defects	14	60	73
Pending Validation	34	246	379
Closed or Other	144		
Total Defects	192		
Project: Manager Core Mail Enabl			
Defect Statistics	Priority 1	Priority 2	Priority 3
Open Defects	1	1	1
Pending Validation	7	1	1
Closed or Other	12		
Total Defects	10		



What are you
really worth?



THE SOFTWARE DEVELOPERS' MAGAZINE
EXE

See the EXE Salary Survey between pages 50 & 51

What are you really worth?

Is your salary right for the job you do? Perhaps you think that you should be paid more. Here's your chance to find out how your salary compares with colleagues in similar jobs. Help us to understand the current situation by telling us about your job and we'll give you the real story.

The questionnaire is anonymous and all details will remain confidential. Just tick which job you do, fill in your rate of pay and tell us a bit about your track record. Then send this form to us (postage paid). And please pass it on - photocopy this page and get your colleagues to complete it too. The more of you who respond, the more accurately we can tell you what the going rates for your skills and experience are.



For each completed questionnaire we receive, we will give £1 to the Bletchley Park Trust or Intermediate Technology. Please tick which charity you prefer us to donate to.



Just fold and secure this survey and send back to us - Freeport or by fax on 0171 970 6741.

Your job

1. Are you a contractor?

- ☐ a Yes ☐ b No

(Note for contractors: where the survey mentions 'your company' you should treat this as your current client/employer, not your own business.)

1.a. If yes, how many years have you worked as a contractor?

- ☐ a Less than 1
☐ b 1-2 years
☐ c 2-4
☐ d 4-6
☐ e 6-10
☐ f 10+

Contractors: go to question 3

2. Are you in full-time employment?

- ☐ a Yes ☐ b No

2.a. If yes, how many years have you been in full-time employment?

- ☐ a Less than 1
☐ b 1-2 years
☐ c 2-4
☐ d 4-6
☐ e 6-8
☐ f 8-10
☐ g 10-12
☐ h 12+

2.b. If no, are you in part-time employment?

- ☐ a Yes ☐ b No

2.b.1. If yes, how many years have you been in part-time employment?

- ☐ a Less than 1
☐ b 1-2 years
☐ c 2-4
☐ d 4-6
☐ e 6-8
☐ f 8-10
☐ g 10-12
☐ h 12+

2.c. If no, are you self-employed?

- ☐ a Yes ☐ b No

2.c.1. If yes, how many years have you been self-employed?

- ☐ a Less than 1
☐ b 1-2 years
☐ c 2-4
☐ d 4-6
☐ e 6-8
☐ f 8-10
☐ g 10-12
☐ h 12+

Which of the following best describes your company/client's main activity?

- ☐ a IT ☐ e Telecoms
☐ b Industry ☐ f Education
☐ c Finance ☐ g Government
☐ d Services ☐ h Other

Which of the following best describes your current job title?

- ☐ a Software developer ☐ e Technical director
☐ b Software engineer ☐ f Contract programmer
☐ c Analyst/Programmer ☐ g Database developer
☐ d Consultant ☐ h Other

Do you work in the software development department of your company/client?

- ☐ a Yes ☐ b No

Do you have a formally-agreed flexi-time arrangement?

- ☐ a Yes ☐ b No

Which programming languages do you use in your job?

- ☐ a C ☐ HTML
☐ b C++ ☐ XSL
☐ c Visual Basic ☐ J/Perl
☐ d Delphi ☐ Fortran
☐ e Java ☐ Cobol
☐ f Assembler ☐ SQL
☐ g Perl ☐ Non SQL databases
☐ h JavaScript ☐ z Others
☐ i VBScript

8. Which platforms do you develop for (tick all that apply)?

- ☐ a Windows ☐ d Embedded
☐ b Unix ☐ e VMS
☐ c DOS ☐ z Others

9. Which platforms do you do development work on (please tick all that apply)?

- ☐ a Windows ☐ d Embedded
☐ b Unix ☐ e VMS
☐ c DOS ☐ z Others

10. What type of development are you primarily involved with?

- ☐ a Bespoke apps ☐ d Embedded apps
☐ b System software ☐ e VMS
☐ c Off-the-shelf apps ☐ z Other

11. Are the users of your software primarily in-house?

- ☐ a Yes ☐ b No

Money matters

(Note for contractors: for 'salary', read 'average yearly remuneration' - this is the average total amount incoming from contracts, not any salary/fee you pay yourself if you have your own company.)

12. Which of the following ranges does your current salary fall into?

- ☐ a Less than £10,000 ☐ j £35,000-£37,999
☐ b £10,000-£14,999 ☐ k £38,000-£40,999
☐ c £15,000-£16,999 ☐ l £41,000-£49,999
☐ d £17,000-£19,999 ☐ m £50,000-£59,999
☐ e £20,000-£22,999 ☐ n £60,000-£69,999
☐ f £23,000-£25,999 ☐ o £70,000-£79,999
☐ g £26,000-£28,999 ☐ p £80,000-£89,999
☐ h £29,000-£31,999 ☐ q £90,000-£99,999
☐ i £32,000-£34,999 ☐ r £100,000+

13. Do you feel your current salary is:

- ☐ a Too high ☐ d Slightly low
☐ b Quite high ☐ e Very low
☐ c About right

14. Do you feel your current salary accurately reflects your skills and abilities?

- ☐ a Yes ☐ b No

15. Do you receive an annual bonus?

- ☐ a Yes ☐ b No

15.a. If yes, what % of your salary does this bonus represent?

- ☐ a Less than 5% ☐ c 10-14%
☐ b 5-9% ☐ d 15%+

16. What was your salary range 12 months ago?

- ☐ a Less than £10,000 ☐ j £35,000-£37,999
☐ b £10,000-£14,999 ☐ k £38,000-£40,999
☐ c £15,000-£16,999 ☐ l £41,000-£49,999
☐ d £17,000-£19,999 ☐ m £50,000-£59,999
☐ e £20,000-£22,999 ☐ n £60,000-£69,999
☐ f £23,000-£25,999 ☐ o £70,000-£79,999
☐ g £26,000-£28,999 ☐ p £80,000-£89,999
☐ h £29,000-£31,999 ☐ q £90,000-£99,999
☐ i £32,000-£34,999 ☐ r £100,000+

17. Roughly what amount in salary increases do you expect to receive within the next 12 months?

- ☐ a No increase
☐ b £3,000-£3,999
☐ c £4,000-£4,999
☐ d £5,000-£5,999
☐ e £6,000-£6,999
☐ f £7,000-£7,999
☐ g £8,000-£8,999
☐ h £9,000-£9,999
☐ i £10,000-£10,999
☐ j £11,000-£11,999
☐ k £12,000-£12,999
☐ l £13,000-£13,999
☐ m £14,000-£14,999
☐ n £15,000-£15,999
☐ o £16,000-£16,999
☐ p £17,000-£17,999
☐ q £18,000-£18,999
☐ r £19,000-£19,999
☐ s £20,000-£20,999
☐ t £21,000-£21,999
☐ u £22,000-£22,999
☐ v £23,000-£23,999
☐ w £24,000-£24,999
☐ x £25,000-£25,999
☐ y £26,000-£26,999
☐ z £27,000-£27,999
☐ aa £28,000-£28,999
☐ ab £29,000-£29,999
☐ ac £30,000-£30,999
☐ ad £31,000-£31,999
☐ ae £32,000-£32,999
☐ af £33,000-£33,999
☐ ag £34,000-£34,999
☐ ah £35,000-£35,999
☐ ai £36,000-£36,999
☐ aj £37,000-£37,999
☐ ak £38,000-£38,999
☐ al £39,000-£39,999
☐ am £40,000-£40,999
☐ an £41,000-£41,999
☐ ao £42,000-£42,999
☐ ap £43,000-£43,999
☐ aq £44,000-£44,999
☐ ar £45,000-£45,999
☐ as £46,000-£46,999
☐ at £47,000-£47,999
☐ au £48,000-£48,999
☐ av £49,000-£49,999
☐ aw £50,000-£50,999
☐ ax £51,000-£51,999
☐ ay £52,000-£52,999
☐ az £53,000-£53,999
☐ ba £54,000-£54,999
☐ bb £55,000-£55,999
☐ bc £56,000-£56,999
☐ bd £57,000-£57,999
☐ be £58,000-£58,999
☐ bf £59,000-£59,999
☐ bg £60,000-£60,999
☐ bh £61,000-£61,999
☐ bi £62,000-£62,999
☐ bj £63,000-£63,999
☐ bk £64,000-£64,999
☐ bl £65,000-£65,999
☐ bm £66,000-£66,999
☐ bn £67,000-£67,999
☐ bo £68,000-£68,999
☐ bp £69,000-£69,999
☐ bq £70,000-£70,999
☐ br £71,000-£71,999
☐ bs £72,000-£72,999
☐ bt £73,000-£73,999
☐ bu £74,000-£74,999
☐ bv £75,000-£75,999
☐ bw £76,000-£76,999
☐ bx £77,000-£77,999
☐ by £78,000-£78,999
☐ bz £79,000-£79,999
☐ ca £80,000-£80,999
☐ cb £81,000-£81,999
☐ cc £82,000-£82,999
☐ cd £83,000-£83,999
☐ ce £84,000-£84,999
☐ cf £85,000-£85,999
☐ cg £86,000-£86,999
☐ ch £87,000-£87,999
☐ ci £88,000-£88,999
☐ cj £89,000-£89,999
☐ ck £90,000-£90,999
☐ cl £91,000-£91,999
☐ cm £92,000-£92,999
☐ cn £93,000-£93,999
☐ co £94,000-£94,999
☐ cp £95,000-£95,999
☐ cq £96,000-£96,999
☐ cr £97,000-£97,999
☐ cs £98,000-£98,999
☐ ct £99,000-£99,999
☐ cu £100,000+

18. If you changed job/client what increase in salary would you expect?

- ☐ a No increase
☐ b £3,000-£3,999
☐ c £4,000-£4,999
☐ d £5,000-£5,999
☐ e £6,000-£6,999
☐ f £7,000-£7,999
☐ g £8,000-£8,999
☐ h £9,000-£9,999
☐ i £10,000-£10,999
☐ j £11,000-£11,999
☐ k £12,000-£12,999
☐ l £13,000-£13,999
☐ m £14,000-£14,999
☐ n £15,000-£15,999
☐ o £16,000-£16,999
☐ p £17,000-£17,999
☐ q £18,000-£18,999
☐ r £19,000-£19,999
☐ s £20,000-£20,999
☐ t £21,000-£21,999
☐ u £22,000-£22,999
☐ v £23,000-£23,999
☐ w £24,000-£24,999
☐ x £25,000-£25,999
☐ y £26,000-£26,999
☐ z £27,000-£27,999
☐ aa £28,000-£28,999
☐ ab £29,000-£29,999
☐ ac £30,000-£30,999
☐ ad £31,000-£31,999
☐ ae £32,000-£32,999
☐ af £33,000-£33,999
☐ ag £34,000-£34,999
☐ ah £35,000-£35,999
☐ ai £36,000-£36,999
☐ aj £37,000-£37,999
☐ ak £38,000-£38,999
☐ al £39,000-£39,999
☐ am £40,000-£40,999
☐ an £41,000-£41,999
☐ ao £42,000-£42,999
☐ ap £43,000-£43,999
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☐ as £46,000-£46,999
☐ at £47,000-£47,999
☐ au £48,000-£48,999
☐ av £49,000-£49,999
☐ aw £50,000-£50,999
☐ ax £51,000-£51,999
☐ ay £52,000-£52,999
☐ az £53,000-£53,999
☐ ba £54,000-£54,999
☐ bb £55,000-£55,999
☐ bc £56,000-£56,999
☐ bd £57,000-£57,999
☐ be £58,000-£58,999
☐ bf £59,000-£59,999
☐ bg £60,000-£60,999
☐ bh £61,000-£61,999
☐ bi £62,000-£62,999
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☐ bo £68,000-£68,999
☐ bp £69,000-£69,999
☐ bq £70,000-£70,999
☐ br £71,000-£71,999
☐ bs £72,000-£72,999
☐ bt £73,000-£73,999
☐ bu £74,000-£74,999
☐ bv £75,000-£75,999
☐ bw £76,000-£76,999
☐ bx £77,000-£77,999
☐ by £78,000-£78,999
☐ bz £79,000-£79,999
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☐ cb £81,000-£81,999
☐ cc £82,000-£82,999
☐ cd £83,000-£83,999
☐ ce £84,000-£84,999
☐ cf £85,000-£85,999
☐ cg £86,000-£86,999
☐ ch £87,000-£87,999
☐ ci £88,000-£88,999
☐ cj £89,000-£89,999
☐ ck £90,000-£90,999
☐ cl £91,000-£91,999
☐ cm £92,000-£92,999
☐ cn £93,000-£93,999
☐ co £94,000-£94,999
☐ cp £95,000-£95,999
☐ cq £96,000-£96,999
☐ cr £97,000-£97,999
☐ cs £98,000-£98,999
☐ ct £99,000-£99,999
☐ cu £100,000+

19. What range do you expect your salary to fall into in three years time?

- ☐ a Less than £10,000 ☐ j £35,000-£37,999
☐ b £10,000-£14,999 ☐ k £38,000-£40,999
☐ c £15,000-£16,999 ☐ l £41,000-£49,999
☐ d £17,000-£19,999 ☐ m £50,000-£59,999
☐ e £20,000-£22,999 ☐ n £60,000-£69,999
☐ f £23,000-£25,999 ☐ o £70,000-£79,999
☐ g £26,000-£28,999 ☐ p £80,000-£89,999
☐ h £29,000-£31,999 ☐ q £90,000-£99,999
☐ i £32,000-£34,999 ☐ r £100,000+

20. Is earnings potential the main reason you work within the IT industry?

- ☐ a Yes ☐ b No

Your track record

21. How many employees are there at your company/client in the UK?

- ☐ a Less than 5
☐ b 5-9
☐ c 10-49
☐ d 50-99
☐ e 100-499
☐ f 500+
☐ g Don't know

22. What is the size of your software development team?

- ☐ a One
☐ b 2-5
☐ c 6-12
☐ d 13-20
☐ e 21+
☐ f Don't know

23. Where are you based?

- ☐ a London
☐ b South East
☐ c Midlands
☐ d North West
☐ e M4 corridor
☐ f South West
☐ g Scotland
☐ h Southern England
☐ i North East
☐ j East Anglia
☐ k Wales
☐ l Northern Ireland
☐ m Other

24. Which if any of the following qualifications do you possess (please tick all that apply)?

- ☐ a Degree
☐ b A-Level
☐ c GCSE/O-Levels
☐ d Masters/postgrad
☐ e HND/HNC
☐ f PhD / other doctorate
☐ g MCP
☐ h MCSE / MCS
☐ i MCSP
☐ j MVP
☐ k CNE
☐ l Others