

January 1995

EXE

The Software Developers' Magazine

£3.20

New Year
IT Vacancies
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Hardware for the Hardened Developer

Interfacing with
the real world

A developer's
perspective of
IBM DOS 7.0

Life of C in the balance

Notes for Very
Important Programmers



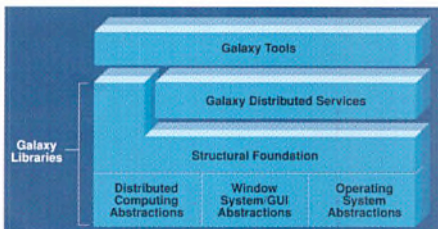
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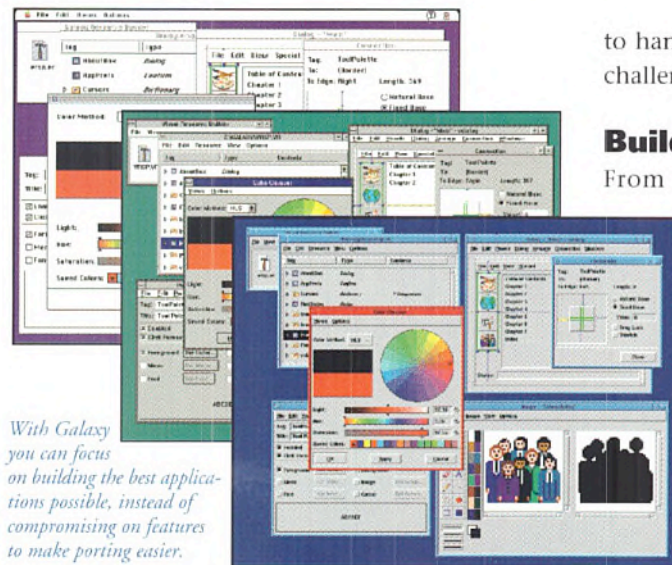
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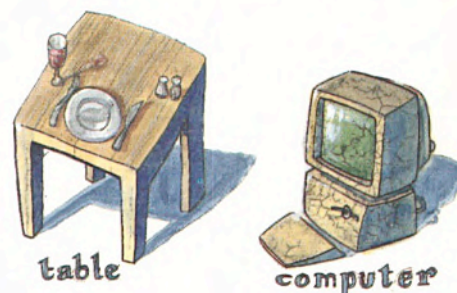
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Software developers are a strange bunch. Some stick adamantly to vi. Others hook onto the latest trend as if it were fashionable. Martin Bennet argues it is all because the tools aren't right.

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When it stops selling well, add more features. And when that stops selling well, add some more again, and again until... Jules, our great philosopher, has a theory.



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News & Views

Velocis = (SQL + Record + C + OO) Server

Raima Database Manager has earned a fine reputation as the fastest, most powerful database engine on the market. Raima have now released Velocis, their SQL client/server engine with a difference. It includes the usual advanced features such as ANSI SQL, ODBC, multithreading, stored procedures, triggers, transaction processing, declarative referential integrity, etc, etc.

What makes it different are the facilities which let you escape from SQL and create very high performance custom applications. For example, you can write stored procedures in C as well as SQL. There is a low-level record API for direct control of hybrid relational/network databases. And you can add your own custom API (in C) which can be called in the same way as the record API and the SQL API. Flexible enough?

Then you can get Raima Object Manager that lets you use Velocis as an OODBMS. Add persistence to any C++ object, object identity, class hierarchies with multiple inheritance, container classes, safe type checking, BLOBs, etc. What are you waiting for? Call us for full details.

Warp into OS/2 with OWL or Zinc

Borland have ported ObjectWindows 2.0 to PM in Borland C++ 2.0 for OS/2, to create a very attractive cross-platform solution. If you want to hedge your bets in the Warp/Windows battle, check it out. Ask about the new version of Zinc as well.

Warp into OS/2 with Pascal

Prospero have released their first 32-bit Intel compiler with OS/2 as the first target. Their Extended Pascal is ideal if you want a securely typed compiled language. For a limited period we are virtually giving it away at ONLY £110. Cabot have ported their 32-bit Power System to OS/2 as well so you can choose between UCSD and Extended Pascal.

Warp into OS/2 with C Set++ and VisPro/C++

We have also started selling IBM's C Set++ compilers and Hockware's VisPro addons for them. Call us for full details.

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Programming in harmony

Whatever happened to
sleek, stylish code?



Software developers would do
well to keep their comments to
themselves...

Consider the concert pianist. Her fingers are the tools through which she plays the music. Her ears provide the feedback so that she knows whether she is playing correctly. Her eyes are trained on the sheet music. Music that was written maybe two or three centuries earlier. Yet it contains all the information she needs to understand and interpret the music in the way the composer intended. The tempo will tell her whether the music should be played fast or slow. The time signature will indicate how the rhythm should be constructed. And the key signature will give her a hint as to how she should interpret the notes on the stave that follows. Before she even plays a single note she will already have some idea of how the music should sound. She will know whether the notes should be white or black, long or short, loud or soft.

This form of notation may be considered extremely terse to those who do not read music. But for the concert pianist sheet music contains all she needs to know. It is, in effect, the composer's words. He did not have to write any separate instructions. He did not have to explain to all, in more verbose terminology, the way in which the music was to be interpreted. It was written so that the musically literate could read it. Those who have learnt this 'language' should have no difficulty in understanding it.

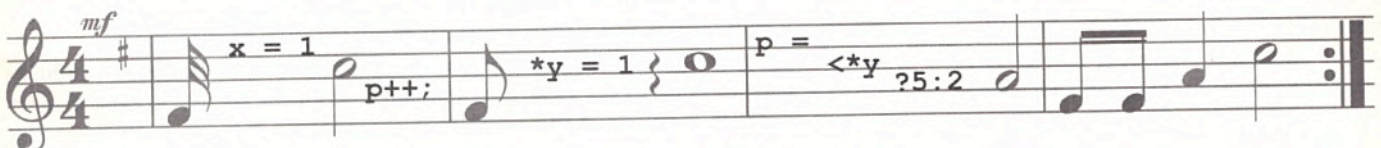
In many ways, reading music is similar to reading source code. It is highly unlikely, though not impossible, that source code will be read by a non programmer. Sheet music is not much use to someone who has not learnt to interpret its symbolic meaning. Likewise, source code is pretty useless unless someone or some thing can understand it. Yet programmers are told, no, ordered, to comment their source code liberally. Comments obscure the actual work. In many ways they are self defeating. If the composer had decided to write explanatory text within his music, consider how difficult it would then have been to read. Certainly the concert pianist would be most unwilling to play from a hefty tome. To a live audience, it would be near impossible. Imagine her frustration with having to turn the page after a single phrase of music. The same is true of the experienced software developer being

forced to turn page upon page of source listing in order to find useful code. A well-written program should be self-documenting just as music is.

In its youth, software development was prone to the sin of badly written code. Structured programming was unheard of. GOTO was king and all around people were crying for change. That change came with almost evangelical energy and enthusiasm through the gospel of *The Comment*. Soon it was everywhere. No file unopened; no line untouched. Source code would never be the same again. And behold! The good programmers did spread the word. Yet in their exodus from bad programming practices, they mistook heavily commented programs for well written ones. Programming elegance was lost by an onslaught of vulgar, verbose source code. Listings became overweight yet were light on actual content. And worst of all, the comments themselves were often factually incorrect. Rather than help the reader, enhancing his understanding of the program they became confusing, and sometimes downright ambiguous. The usual problem was that of the programmer not updating the comment when the source code was changed.

Software development became a serious issue in the early 1950s. Yet few programmers would ever consider reading 40 year old source code. In the world of music, however, the works of Bach, Mozart and Handel, now centuries old, are still being played and enjoyed across the world. Software developers are composers of software. While their work will never attain the level of recognition of these composers, software developers could still take a lesson or two from musicians. The reason why music is timeless and can be enjoyed by an audience centuries after its composer has died is because it is concise, elegant and contains no superfluous information. A well-written program does not need any comments. If software developers were to abandon writing eloquent comments to their badly written programs, they could spend more time creating beautiful, sculptured code. Then their source code could be treated with the same respect as a classical piece of music.

Cliff Saran



Mining for talent

The winner of the 1994 Business Software Challenge 90's design competition was Chaoushui Xu from the University of Leeds. The competition was sponsored by Computer Associates in conjunction with the *Financial Times*. Its aim is to challenge student software designers in higher education institutions across the UK. The brief was to create 'original and practical software which addresses identified business needs.' The winner developed an application for the mining industry that evaluated the financial risks involved in a new mining project anywhere in the world. The software was developed on a 386 PC under MS-DOS 4.0 using a Zortech C++ 3.1 compiler. First prize was £3,000 in cash, a laptop PC and £10,000 worth of software from Computer Associates.

Closer to CORBA

There appears to have been a breakthrough in the long haul for a CORBA 2.0 standard. The committee has agreed upon a de facto standard for interoperability in heterogeneous computing systems. The specification details a protocol for two-way communications over TCP/IP between Object Request Brokers (ORBs) from different companies. The OMG has also voted to adopt a C++ mapping to the CORBA Interface Definition Language which will enable developers to create CORBA compliant objects in C++.

Licence to NetWare

Novell has been taking a close look at the existing licensing of NetWare and has revamped it. Why? Well, Novell says that in preparation for the launch of NetWare 4.1 later this month, it will be trying to match user requirements more closely. Previously when a customer needed to purchase a 275-user it was necessary to buy the closest NetWare licence that matched the requirement. In this case that meant a 500-user license. Now Novell will be offering 5-, 10-, 25-, 50-, 200- 250-, 500 and 1000-user packs. These can be combined additively to meet the required user count.

Smalltalk business

An agreement between ParcPlace and IDE will result in the integration of IDE's StP/OMT 2.0 into VisualWorks 2.0. StP, or Software through Pictures, to give its complete name enables developers to create business models. The announcement will mean that such models can form the basis of Smalltalk applications in VisualWorks. The extent of the integration will mean that users of StP/OMT will be able to perform full forward and reverse engineering of Smalltalk code and build analysis and design models.

Could have been Borland...

In the last issue we announced the merger of Sybase and Powersoft. To some, this merger came as a surprise. There were rumours that Sybase was looking to buy a client tool company, but the name of Borland was given more often than Powersoft. John Spiers, marketing director of Sybase Northern Europe considers that 'when we made the Borland announcement (see EXE's previous issue), the emphasis was on serving the dBASE community. This is why it was speculated that Borland was up for sale.' Guy Martin, European marketing manager for development tools at Borland, of course denies these rumours stating that Borland is in a strong position, making a profit in the last two quarters. 'The merger will not change anything to our agreement [with Sybase].'

Another factor that doesn't bode well in this merger, is that both companies involved have a commitment to 'openness' and do have relationships with a number other client tools and server companies. This is confirmed by Colin Tenwick, VP marketing and channel sales of Sybase Europe: '[Powersoft's and Sybase's] products have as part of their architecture a desire of 'openness' and [we] are working very closely with other third party product's companies.' So why has this merger happened?

It is too early to have a clear idea of the impact the merger will have on both companies and on the rest of the industry. The merger still has to be approved by the SEC and the shareholders. What is known is that both technical teams are already meeting to share their technology and discuss how products could evolve. First products resulting from the merger should appear in the second half of 1995 at the earliest. Sybase is on 01628597400 and Powersoft on 01628 345000.

	POWERSOFT	SYBASE
Products	Clients	Servers
Platforms	Windows	Unix
Distribution	Channels	Direct
Open to	Multi RDBMS	Multi tools & connectivity

Powersoft and Sybase comparison

Powersoft and Sybase comparison

Risk losing independence

Until very recently, Powersoft was the market leading provider of Client/Server. Its closest competitor being Gupta with SQL Windows. The strength of Powersoft has undoubtedly been its independence from any RDBMS company. But that has all changed. Developers are likely to question just how independent Powersoft really is now that it will be merged with Sybase. Sybase is second to Oracle in the relational database market. Developers are worried that unwittingly they will become the pawns through which it executes its attack on Oracle. With Powerbuilder, Sybase is in a position to unleash a sinister weapon. Imagine the uncertainty facing those who use Powerbuilder as a front end to Oracle 7. Will the Oracle driver be as efficient as the equivalent Sybase one. More importantly, will it be shipped at the same time?

Paul Thompson, business developers manager at Softa, a system consultancy specialised in PowerBuilder developments expresses his concerns 'if they start to move away [from their current openness] that will give us problems.'

Both Sybase and Powersoft are trying to reassure their partners and developers but only the future will tell. John Spiers put forward the fact that in the database market, most vendors used to own 100% of their tools market. But with its Client/Server architecture, this was never the case for Sybase. He analyses that the 'market splits 50/50 between people who perhaps feel they want to be independent for the sake of independence and those who seek integration. We see opportunities from the Sybase side for growth of the share of its own tools market, but I'm sure that we don't anticipate growth to anything like 100%. Those days are gone.'

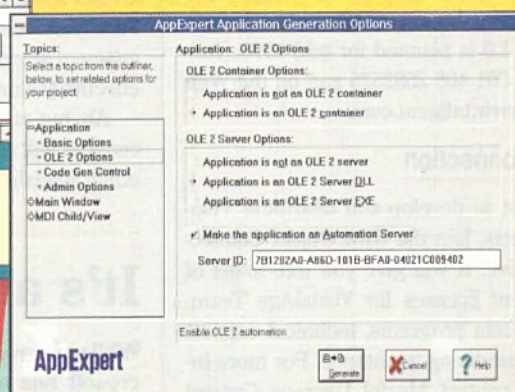
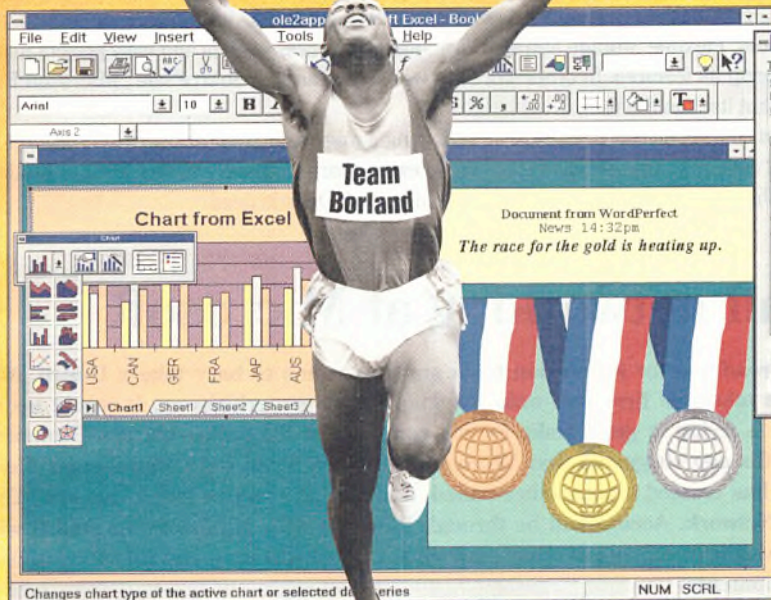
Vic Morris, Powersoft Europe's MD, confirms the same view: 'From the first release of Power Builder, it was architected to be very easy to use with a wide variety of databases and that database independence will continue.' Reactions of at least one Sybase partner and Powersoft competitor, are positive.

Paul Thompson also has some hope that 'the merger will improve the stability and the reliability of [Powersoft's] development environment.' But it should result in a company worth in excess of \$1 billion with R&D working together. So if all goes well, it should definitely improve the stability and the integration of the different products to provide a full desktop to the enterprise solution. But for the merger to capitalise on the success of both Sybase and Powersoft, both companies will have to stay open and resist the temptation to give too many advantages to each other.

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Exit TALÆ, welcome CommonPoint

The Taligent Application Environment (see EXE November 1994) has been renamed CommonPoint. Joe Guglielmi, chairman and CEO, states that the reason for this new branding is that Taligent will be able to ensure a consistent set of OO APIs are deployed across leading hardware and OS architectures such as AIX, OS/2 and HP-UX. 'This will provide developers and users with a common point for a new generation of computing,' he commented. The launch of release 1.0 is planned for mid 1995. Taligent is on 001 408 2552525 and on the Web at <http://www.taligent.com>.

Object Connection

If you want to develop and distribute VisualAge objects, join the IBM Object Connection initiative. It will give you free loans of development licenses for VisualAge Team, access to beta programs, technical support and merchandising assistance. For more information contact Muriel Decroos Caravel at 0033 92115891 or by email at mdc@vnet.ibm.com

Check your licenses

Beginning January 1995, terms in software companies contracts which are unfair to the consumer may simply be deleted. This is due to a new European directive. The UK government might defer this legislation until July 1995. Now is a good time to check your standard contracts. A free guide, *Unfair Terms in Consumer Contracts* is available from the law firm MacFarlanes (0171 831 9607).

Novell, phone home

Version 2 of Novell's NetWare Telephony Services adds support for new platforms and languages: Macintosh, OS/2, NT, UnixWare and... Spanish, French, Czech and Hungarian. In addition it also connects on TCP/IP from Windows desktops. The TSAPI is based on the Computer Supported Telecommunications Application (CSTA) standard. For NetWare 4 users, this new release of Telephony Services integrates with the NDS facilities. Novell is on 01344 724000.

Open government

The UK government is heading towards the Internet. Information from the Machinery of Government Division, the Citizen's Charter Unit and HMSO is already available from <http://www.open.gov.uk>. The government centre for information systems (CCTA) published a report on 'Information Superhighways' in June last year which proposes a framework to create joint ventures between the industry and the government.

SourceSafe spells death to Delta

It has been a busy few months for Microsoft, beginning with the acquisition of One Tree Software on 16th November. One Tree produces a source code control system called SourceSafe which provides backtracking to previous versions, branching and merging. There are also facilities for managing multiple releases and configuration management. Microsoft obviously sees the acquisition as a means to strengthen the company's development tools strategy. As Andrew King, the European marketing manager for development tools, rightly points out, '[developers] are demanding more support for team-based development.'

Presumably they expected source code control and team development support in Microsoft's Delta product? In Microsoft's own words, taken from the *Delta User Guide*, 'Microsoft Delta provides many features that simplify version control.' It then goes on to list Safe Parallel Access, Flexible Storage and Retrieval, Reliable access control and easy project management among its features. In other words, it would appear with SourceSafe, Microsoft has effectively shot itself in the foot.

Ah, but of course, the company will be providing a migration path for users of Delta. All licensees will obtain a copy of SourceSafe at no extra charge. There will also be a migration utility available. So, as of December 31st 1994, Microsoft Delta is dead.

It's all networking at Microsoft

While the roadmap for its version tools strategy seems to have taken a U-turn, Microsoft has taken its first step onto the information superhighway. It would seem that Gates is trying to get a stake for his company in the online market. Rumours some months ago suggested that Microsoft would be acquiring CompuServe. Well, instead, it has created a competitor called, and I think you can guess this one, The Microsoft Network. Access will be through Windows '95. Microsoft has said it will not be providing interfaces to other platforms. But we will keep you informed of further developments.

In a separate announcement Microsoft appears to have taken measures to improve its flagging reputation among network providers. It is providing the source code for the networking technology in Windows '95 for free to a number of leading network companies. These are Artisoft, Banyan Systems, Digital Equipment Corporation, Novell and Sun.

The end result should be better interoperability between heterogeneous networks. 'Our customers are demanding that Windows works with NetWare and other network services,' commented David Bridger, product manager for personal operating systems at Microsoft. But David, surely it was supposed to in the first place? At least that's what it says on the back of the Windows 3.11 box. Presumably the same is true of the current Windows 95 beta.

Speaking on the announcement Graeme Allan, brand marketing director at Novell was confident that 'this cooperation will enable Novell to develop a superior NetWare client for Windows 95.' Does this mean that Microsoft's own NetWare client for Windows 95 is a tad flaky...

Insignia Software reference platform

It should come as no surprise that the emulation people at Insignia will be supporting the recently announced Apple/IBM/Motorola hardware reference platform for the PowerPC within the company's SoftWindows product family. As explained later in this issue, the new platform defines an architecture which will enable any hardware or software producer to create PowerPC-based computer products. Robert P Lees, CEO of Insignia believes the hardware reference platform will change the way the industry perceives personal computers. 'The ability to run a multitude of operating systems on a single computer will make this an especially important machine for the corporate environment.' He added he was 'excited' that his company would be supporting the product. SoftWindows is now available on PowerMacintosh and IBM RS/6000 running Unix. It has recently been ported to the Motorola PowerStack family of PowerPC based workstations. In addition, Insignia has a technology agreement with Microsoft. The result of this is featured in Risc-based NT for Mips, including the recent NT 3.5 release.

Famous Last Words

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JUNE 1994



StarBase

Not VBDOS

Recital has introduced a new 4 GL for building 32-bit DPMI-compliant applications. It's called (would you believe?) Visual Recital. Despite its name, the tool is at present not available under Windows. DOS and Motif are the supported platforms. But Recital is in the process of producing a Windows version. The IDE is similar to Visual Basic for DOS with a forms designer, Object Inspector and Event Editor. The development language is compatible with xBASE yet offers OO extensions. Database support includes all leading RDBMSs. Recital is on 0344 301444.

Digitalk goes visual

Digitalk has combined Parts Workbench with Smalltalk/V to produce Visual Smalltalk. (Oh, I do wish someone would seriously consider censoring that word.) Anyway, performance issues have been addressed. Digitalk claims to have improved computational performance by 50%. Graphical performance has also been improved. It is now apparently a hundred times faster. How? Well by reducing memory footprint, faster window opening and a new implementation of collection classes that improve storage and retrieval performance for large data sets. There is now a binary portable format that allows link libraries to be created and used on different operating systems without modification. An application coordinator framework is provided. This separates the platform specific element of the user interface from portable code. Visual Smalltalk is priced at £995. Enterprise version costs £3,500. Both are distributed in the UK by Cocking and Drury (071 436 9481).

Trigger happy Watcom

Stored procedures and triggers are the two major enhancement to the new version of Watcom SQL. Watcom SQL 4.0 is a scalable relational database engine available as either standalone or multi-user on Windows, Windows NT, OS/2, NetWare NLM and DOS. The implementation of stored procedures and triggers is based on the draft ANSI SQL definition of Persistent Stored Modules (PSMs). Other enhancements to version 4.0 include support for referential integrity, ability to run multiple databases on the same server and new support for TCP/IP. The standalone version of Watcom SQL 4.0 is priced at 205 on all platforms. The network server version for NT, OS/2 and NLM costs 559 for a six-user licence and 1,119 for a 16-user licence. Watcom is a subsidiary of Powersoft which can be reached on 0628 34500.

Trials and tribulations with NT 3.5

Windows NT Server 3.5 and Windows NT Workstation 3.5 are finally available. As you may recall we had installed NT 3.1 (see EXE May 1994) and we decided to move to 3.5 a few weeks ago. Since Windows NT 3.1, most of the system has been rewritten, so the performance is vastly improved. The server version is mainly the workstation plus all the additional server functionality. The core of the code is the same between the two versions.

In addition to the increase in speed, NT 3.5 is also much more robust. At EXE, we had quite a few problem with NT 3.1. The network option of the control panel could not be opened, disks needed regular repairs and sometimes the server just stopped for no apparent reason. The only problem we're having so far with NT 3.5 is File Manager not always responding correctly. But closing and reopening it, seems to cure the problem.

The install program lets you upgrade from DOS, NT 3.1 or install from scratch. Depending on the option you choose, you will not end with the same result. According to Michel Lopez, founder of the independent MLC Labs, if you upgrade from NT 3.1 you may end up with dead branches in the registry. This depends on what you've installed previously but results directly in diminished performance and mysterious bugs. For instance, in such a configuration, MS-Mail sometimes doesn't get the correct values out of the registry. So the advice is, if you had NT 3.1 installed, reformat your hard disk and start from scratch. Also the NTFS format has changed, so if you do upgrade, you'll have to go through the process of updating all your NTFS partitions.

Lopez points out another slight problem for anyone wanting to perform a network installation or a DOS upgrade. If you think that copying the content of the CD-ROM to a flat installation directory on your (big) local hard disk will speed up the process, you're wrong. The installation procedure will always create its own flat copy from the CD-ROM even if it's already there. The documentation should be clearer on this point.

If you install an NT server as a domain controller, be sure to chose the right domain name. We didn't find any other way to change the domain name other than by doing a complete reinstallation of the OS.

Compatibility is good but not perfect. Dominique Le Roux, MD of SpartaCom, commented that the serial port sharer his company developed for NT 3.1 didn't work at first on NT 3.5. This happened even when compiling with beta of the SDK 3.5. However, once he received the final SDK 3.5, a simple recompilation generated code that worked fine on both NT 3.1 and NT 3.5. The problem was an incompatibility with a system DLL.

At EXE, NT 3.5 is installed on 486DX-33 with 16 MB of memory. We noticed a definite speed improvement compared to our previous setup. We're probably using more memory now since we've also installed the Macintosh services and a DLC printer. But so far, 16 MB seems to be a good configuration for NT 3.5.

The workstation version costs approximately £239. For the server version, Microsoft has changed its licensing agreement, separating client and server licenses. The server is priced at approximately £525 and the clients at £30. Special upgrade pricings are available from Microsoft at 0734 270001.

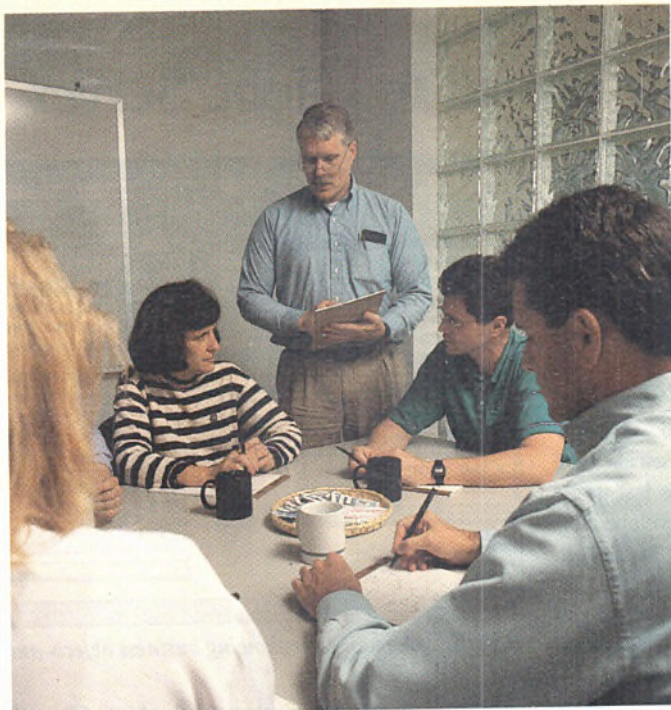
More than a challenge

Last month we ran a story on the EXE Software Developers' Challenge which is taking place on February 8th at Sandown Park. 25 teams will be competing against the clock to create a prototype application for the Royal National Institute for the Blind (RNIB). A diverse selection of development tools are expected to be used including software from CA, IBM, Intersolv, Magic, MDIS, Microsoft, Recital and Software AG. Entrants will be judged

by an independent panel comprising the EXE editorial team, consultants from Rhea and two major end users. The Software Developers Forum, organised by Interactive, will be running alongside the EXE Software Developers' Challenge.

There will be free seminars on building Client/Server applications, OOP, testing and RAD. Remember to come along and see our distinctly tasteful EXE stand with the hands... To pre-register for the show phone 081 541 4865. You can also register by sending email to Softworld@compulink.co.uk or through CompuServe to 100335,3172.



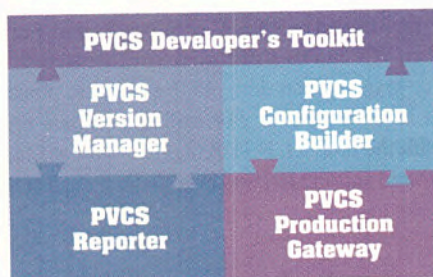


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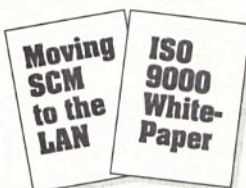
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Version 4 of Crystal Reports claims to improve report generation time by a factor of 10 compared to version 3. SQL reports are also faster to appear. The report generator has been enhanced with 20 new direct calls to the Report Engine, 40 additional VBXs, full OLE 2.0 support and 12 new styles of graphics. The standard edition costs £149 and the professional edition, £299. Both are available from Contemporary Software (01727 811999).

Windows developers get a Mac

Metrowerks is working on a Macintosh based 'x86/Pentium' code generator. Planned for May 1995, CodeWarrior 6 will let developers on Macintosh develop Windows applications. This release will debut Phase Two of Metrowerks' strategic development plan. Mr Galaganos, President and CEO of Metrowerks describes Phase Three as 'our strategy to offer the ability to generate Macintosh, Windows NT/3.1/95 and OS/2 applications.' This Phase is scheduled for May 1996 and will be hosted on the Power-PC platform. The price of CW6 has not been confirmed but free upgrades to CW5 (released this month) and CW6 will be offered if you buy CW4 (£69 and £275 respectively for the Bronze and Gold editions). For information contact Full Moon Software on 01628 660242 or at cw.sales@talk.exnet.com.

SCM for NT

Atria Software has announced ClearCase and ClearCase Multisite for Windows. These new products are additions to its range of software configuration management (SCM) tools. They should be available in Q1 and Q2 respectively for 1995. ClearCase covers the span of version control, workspace management, build management and process controls facilities. It supports multiple teams located at different sites. Synchronisation between the repositories at each site can be done with any type of connection, even by email. The build phase has load/balancing capabilities so all the machines that run ClearCase on a network can be used. The VCS can merge up to 32 developments simultaneously on the same module with a graphical colour comparison. Atria Software is on 01252 845666.

Motif and Windows in one tool

X-Designer 4, the X/Motif and Window GUI builder, can now generate MFC code when in Windows mode. This enables the design of one interface for all version of Windows, ie 3.1/NT/95. The first licence costs £2,995. X-Designer 4 is available from IST (01734 587055).

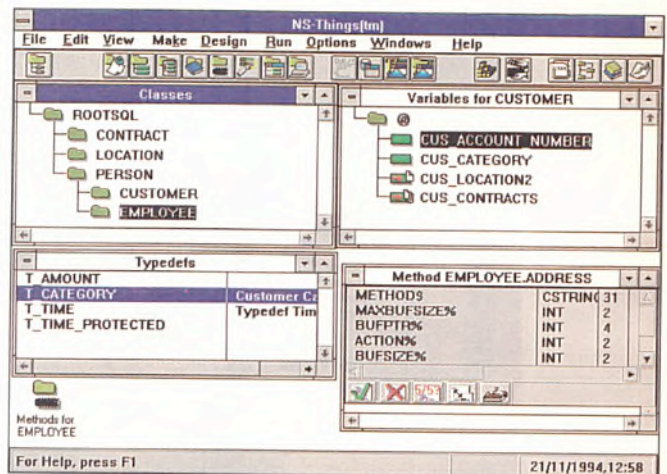
From Pascal to Client/Server

You may not have heard a lot of Nat Systems but it's not a new company. And you will certainly be familiar with a number of its products. In 1987, it developed Object Pascal for OS/2 and in 1988 Quick Pascal. Of course this last product was developed for Microsoft. In 1991, it also participated in the co-development of Quick C for Windows, Visual C++ in

1993 and Visual C++ for NT in 1994. In 1990 Nat Systems' delved into Client/Server with the release of NS-DK/1, followed last year by NS-DK/2. Most of its clients are large companies. According to Jean Marie Pironneau, Nat Systems UK general manager, both Gupta and Borland have attempted to buy Nat Systems.

NS-DK/2 is an OO Client/Server application development toolset which generates both clients and server. Jean Marie Pironneau considers that 'this is where NS-DK/2 differs from the first generation of Client/Servers tools like PowerBuilder, SQL Windows and Visual Basic. Many of [these tools] soon ran into what has become known as Fat Client Syndrome.'

The development is done in a high-level language: in Natsys Control Language. Then the application is interpreted or ANSI C code can be generated. So usually, applications are developed and tested on PCs and then deployed to all the targets. Applications are partitioned either at design time or at generation time. All the business objects are defined with dialog boxes and appear in an inheritance tree. For testing purposes on PCs, NSDB, a small SQL database is included with the product. NS-DK/2 prices start at £14,000 (it depends on the platforms and database you want support for) and is available from Nat Systems (on 0181 3329290).



NS-DK/2 class browser showing business objects and details.

Enterprising stuff

If you attended the Enterprise Developer Show at Earls Court in October you may have seen Symantec demonstrate its Enterprise Developer tool for the first time in the UK. One of the lucky few, no doubt because now the company has announced version 2.0. Arun Gupta, principal architect at Symantec describes Enterprise Developer as a second generation client server tool. So it is a second generation fourth generation language... Seriously though, Arun believes that the first generation of Client/Server tools do not address the relative complexity of application partitioning.

Should rules be kept on a server as stored procedures and triggers? Or should they be coded into the application itself? While the former case fits an idealised model of Client/Server, it doesn't work in practice. Rules should be checked on the data entry form of the application so that the input be corrected if wrong. By the time the data is committed, it is too late. On the other hand, if all processing is performed in the client, developers face the situation of replicating them throughout an organisation when the application or business changes. Symantec tackles the problem in Enterprise Developer through a central repository which stores logical data models, business rules and data locations.

The 'Enterprise' in the name refers to the scalability of applications. Through a technology called SCALE, developed by Symantec, applications created in Enterprise Developer are insulated from underlying data sources. Think of it as a middleware layer. SCALE also generates optimised SQL for specific database engines and enables C++ libraries to integrate within the environment. Master-detail processing and optimistic concurrency control are both automatic. Symantec has written database drivers for a number of leading RDBMSs including Oracle, Sybase and SQL Server. Support for ODBC is also available. Team Enterprise costs £1,319. Solo Enterprise developer costs £589. Version 2.0 should be available by the end of this month. Symantec is on 0628 592222.

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Comparing Object Oriented and Relational Design Methodologies

Feature	POET ODBMS	Relational RDBMS
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Database Model	User Application Model	Separate Database Model Required
C++ Integration	Total	Poor
Database Operations	At Object Level	Must Write Code
Productivity	Increased	Reduced
Complex Object Performance	Excellent	Poor

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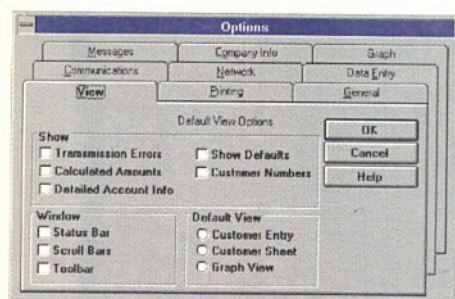
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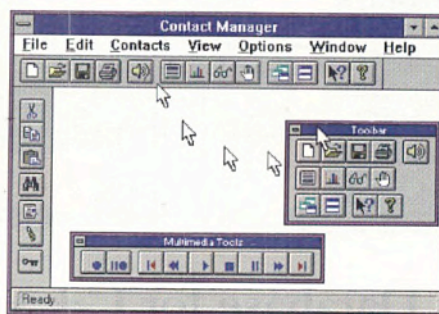
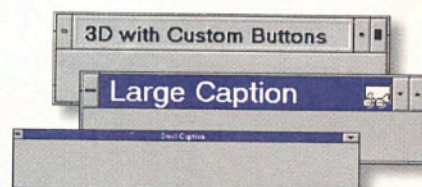


With the Index Tab control you can effectively present several screen's worth of data in the space of one screen extending a metaphor that is familiar to all users - the index card! With labeled tabs neatly presented in multiple rows, the user can see at a glance what options are available and easily navigate between them by pointing and clicking on the desired tab. And since the tabs are active at design time, the developer can easily place controls in the cards by selecting the desired tab and drawing the controls right on the card. All of the tab cards shown above are actually a single Index Tab control.



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The Dockable Toolbar control lets you create floating toolbars of buttons that the user can "dock" (attach) to the top, sides or bottom of an MDI (Multiple Document Interface) form. When toolbars are not docked, the user can resize and reshape the "floating" palette as needed.



The FormFX control allows you to customize the look of your forms by manipulating captions and borders. You can include multi-line text, pictures, alter the height, adjust the fonts and alignment, or add a 3-D look. It also offers significant form control with such features as locking the form at runtime to maintain size, position and lock the form so that it never goes behind another window.

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➤ CIRCLE NO. 888

SOAPBOX

There's now't so queer
as folk says **Martin**
Bennett. Especially software
developing folk.



I have a team of eight developers working for me. They create software development tools. But given a free choice, individually they all use different tools. For example, as it's not important which editor any of these developers use, each has 'obtained' the editor of their preference. The choice varies from *vi* to Epoch and Softedit on UNIX and over less extremes on PC. I am motivated by user centred design. So, naturally I'm curious to establish just what that 'typical' programmer is like. The one for whom we, and other software tools companies, are designing our wares.

Despite its hi-tech environment, programming remains more of a craft than a science. Tool selection is influenced by a huge variety of factors, including budget, familiarity and fashion. When you develop user-oriented products for programmers, it is important to recognise the complexities that are involved.

This phenomenon of differing trends is the biggest single contributor to overall variations in development productivity. Measures of progress such as lines of product code per day can differ wildly. Time is money. And productivity is a measure of how that time is being used.

The differences in the ways developers work are profound. Human nature embraces extremes. From those developers who will doggedly stick to using *vi*, to those who collect tools the way others collect postage stamps. From designers who seek methodological purity, in the latest of methods, to those that have to get code cut before they can visualise a design. The most telling differences can be seen in approaches to testing; some programmers will wait until the system is finished before they test. Others will start testing before they write their first line of code.

Across organisations, the motivation in development teams and the people in them affect the tools that are used. Software developers may not always be who you think they are. The insurance company people grinding out their thirteenth database appli-

cation. The product development company doing V1.0 of its insanely-great new product. The hardware company doing V8.3.4 of its Unix implementation. All are software developers. But they look upon their jobs in completely different ways.

The structure of organisations, their culture, will also affect the way programmers work. Take the extreme case of how per-



formance is assessed. If rewards are based on personal productivity, people are unlikely to share their code with others.

Tools developers have to start somewhere when designing tools for programmers. Traditionally, tools developers have been guided by the ideals of Software Engineering. Consider this a roadmap by which developers pursue a rational path toward the best technological solution.

But as a useful model for tool design this is incomplete. Developers are a most conservative bunch. They will endure extreme inconvenience to remain with the familiar and shun anything that professes to be 'the total solution'. On the other hand, take a small but real problem for developers, solve it neatly and completely, and you get a run-away success.

Software Engineering is a hugely fashion-conscious field. Software theorists are as susceptible to the latest concept as rich widows are to Paris couturiers. Have you caught up with *Object-Oriented Analysis and Design* yet? Next you can try *Domain Analysis and Patterns*. And we can expect a steady stream of new development tools based on these ideas to come to market. But these

tools are as unlikely as their predecessors to make developers more productive.

We seem to know so little about software developers. Their needs have been poorly catered for. How then can we claim to know the needs of the accountants, secretaries and managers for whom all our other products are designed?

The field that is facing up to this kind of problem is Computer-Human Interaction (CHI). One of its themes is the productive use of software systems. It is interesting to observe the kind of approaches that are gaining attention in this community. Throughout the eighties there was a strong input from the area of cognitive psychology. State-of-the-art interface work is now being 'sociologically informed', particularly by anthropological studies in workplaces. These studies can be deeply revealing and a goldmine for the iconoclast.

It is often assumed, for example, that developers pursue a technical ideal. However, in the software industry at present, it is more often the case that code is hacked out in order to meet a deadline. Appeasing the boss has become the ideal.

It is also often claimed that end-users cannot understand formal languages. Of course this is simply not the case. Millions of end-users utilise formal languages in spreadsheets quite happily.

Throughout the eighties hypotheses on how to build satisfactory products for users were researched. Yet they have had hardly any effect on software development tools. Research clearly revealed that developers want to work at several levels of abstraction concurrently. They want to design some parts whilst coding others. This idea has still not been successfully translated into product capabilities for 'standard' methods and 'standard' languages.

If we are to develop tools successfully for the software industry, we need to see more studies of what software developers actually do. Only when we have established developers needs will we be able to satisfy them. Only then will our market be driven by demand rather than fashion.

Martin Bennett is Manager of Advanced Systems at Hitachi Europe. His team build software development tools for ObjectIQ and C++.

Source Code

Which development tool is the most fundamental of all? The performance of this tool will affect everything else. It is, of course, the lump of metal sitting on your desktop or by your feet. **Cliff Saran** searches far and wide for the best PC for software developers.



As a software development magazine it is sometimes easy for us to brush aside the importance of hardware in the software development process. But software development entails choosing the best tools for the job. The PC is the most fundamental of all our tools and warrants serious consideration. If it is too slow it will hinder our productivity. If it doesn't have enough free disk space we may be unable to install our other tools. Obviously there are many other factors. In this article I will be investigating the makeup of a 'good' PC for software development. This is not one of those hardware reviews found in the 600 page hardware magazines at the newsagent. It is intended to illustrate the kind of PC hardware a software developer should consider when upgrading to or purchasing outright. But, before I begin, I must apologise to those of you who do not use the PC as a primary development platform.

It is not all Mips

The faster the processor, the quicker your applications will run. Well, that's not quite the whole story. While doubling the processing speed will certainly increase the performance of an application, it is unlikely to make it run twice as fast. Processing speed is just one of the factors affecting overall performance. Nevertheless, if you want your C++ compiler to run quicker then con-

sider upgrading to a faster processor.

With Pentium-based systems now realistically priced and extremely attractive bargains for 486-base machines, the choice of processor is a difficult one. In an ideal world there would be no choice. Everyone would opt for the Pentium. But budgets have an annoying tendency of restricting what we can and cannot do. And if you cannot afford to buy a Pentium then what are you supposed to do? The 486 is still *numero uno* in terms of popularity. And with clock tripling technology it can outperform the Pentium. Assuming that you abandoned your 386 system long ago, I would say the minimum spec for the processor is the 486 DX2.

Away with thrash

Now if you look at Figure 1 you will see the hardware recommended for a number of development tools and platforms. At one extreme, if you develop for NeXTstep 486 in full, 24-bit colour, then you will need 24 MB of memory. On the other end of the scale there is Win 3.11 which will run in a machine with 4 MB but is better with 8 MB. But even after you have satisfied the minimum requirements for the operating system you will still need to consider the amount of memory needed to host the development tools you wish to run. Take for instance dBASE for Windows. Borland recommends a machine with 6 MB of memory



Operating System	RAM	Hard disk	Processor	CD-ROM drive
Windows 3.11	8 MB or more	12 MB	386 SX or above	No
Windows NT 3.5	16 MB	90 MB	386/25 minimum	Yes to install
OS/2 Warp	8 MB	55 MB	386 SX or above	Recommended to install
NeXTstep 486	24 MB	400 MB	486	Yes to install
Solaris	16 MB	300 MB	486	Yes to install
C++ compilers				
Visual C++ 1.51	8 MB	MB	386	Recommended
Visual C++ 2.0	16 MB	10 MB/100 MB	486	Recommended
Borland C++ 4.5	8 MB/ 16 MB	10 MB/100 MB	486	Recommended
Symantec C++ 7.0	16 MB	90 MB	486	Recommended
Database tools				
dBASE for Windows	6 MB	14 MB	386	No
Paradox for Windows	6 MB	15 MB	386	No
Visual Objects	12 MB	30 MB	486	No
Access	6 MB/8 MB	25 MB	486	No

Figure 1 - Recommendations for running popular tools and environments

Crunchers

to run it. Now it may well run on a lower spec machine, but performance will be greatly hindered. The virtual memory manager in environments like Windows allow the operating system to run applications larger than the physical memory installed in the hardware. They do so by swapping application code to and from physical memory and the hard disk. *Thrashing* occurs when the processor spends more of its time swapping code in and out of memory than executing the actual application. The hard disk is continually accessed and the application becomes increasingly sluggish since it takes more time to read from disk than from physical memory.

The only way to alleviate the problem, and so improve the performance of the application, is to add extra memory. In this situation, plugging in a faster processor will have no effect whatsoever. The more memory installed, the less chance of thrashing. It will not go away altogether though. Consider the case of running several large applications simultaneously under Windows NT. With more memory, the threshold above which the system will begin to thrash is much higher. So how much memory? Ideally you would install as much as you could afford, 32 MB, 64 MB, 128 MB... But realistically, 8 MB is probably too small for serious development work. Aim for 32 MB, but settle for 16. Interestingly, 16 MB of memory makes a good starting point when buying a machine with a mind to upgrade later. The design of most modern motherboards contain eight SIMM sockets for the memory. Four 4 MB SIMMS, giving 16 MB in total, will occupy the first four slots, leaving four free. Now these do not need to be filled with four identical 4 MB SIMM modules to bring the total to 32 MB. You can install four 1 MB modules, adding 4 MB of extra memory to bring the total to 20 MB. When developing under an operating system such as Windows NT 3.5, which has a recommended system requirement of 16 MB, this extra RAM can make a lot of difference, especially if you intend to run a development tool such as Visual C++.

It will also work the other way. Considering that 4 MB of installed memory is the norm, obtaining a machine configured with 16 MB of RAM may be more difficult. As a consequence, your choice of machine will be restricted. To overcome the problem I

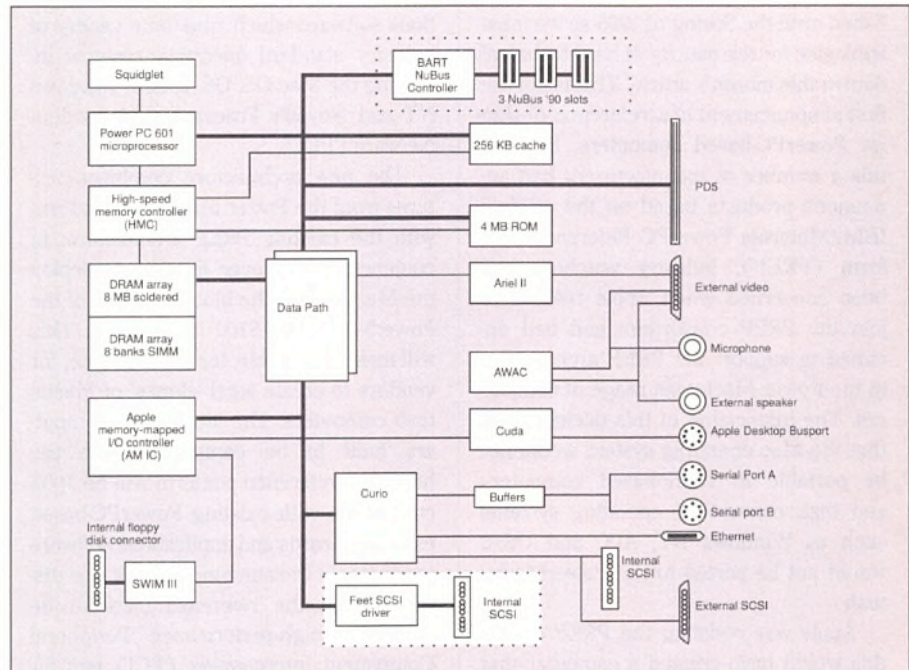


Figure 2 - PowerMac 8100 shares many features with the hardware reference model

would recommend you buy a machine with 4 MB of RAM and upgrade it immediately to 20 MB by adding four 4 MB SIMMs. The thing to remember here is that the motherboard of the machine you intend to purchase contains at least 8 SIMM sockets.

Taking a mega byte

Development tools are notoriously hard disk hungry. Two years ago 20 MB was considered 'big'. Today, a full installation of a compiler like Visual C++ could take up as much as 100 MB, if all the components are installed on the hard disk. Fortunately, such a figure can be drastically reduced. The current trend in running development tools from CDROM has meant that developers do not need huge expanses of free disk space to install their compiler. Borland C++ 4.1 could be run in as little as 70 KB of disk space, although there would be a performance hit, since average access time on a CDROM drive is much slower than hard disk. 15 milliseconds or less for the hard disk compared to at least 150 milliseconds on the CDROM drive. To improve the performance of their software, companies like Microsoft and Borland install the actual compiler component, linker and libraries and include files onto the hard disk. This reduces access to the CDROM. In doing so

they require about 20 MB of disk space.

To determine how much hard disk space you're going to need, look at the operating system you use. OS/2 Warp needs between 30 MB and 50 MB of disk space. 30 MB for Windows 3.11 is not uncommon either. Now add a further 20 MB for the swap file. Then you start installing the development tools. 20 MB for the C++ compiler, 10 MB for a third party library or two then another 40 MB for other development tools. For instance, you may wish to install Visual Basic, Paradox for Windows, PVCS or a CASE tool as well. This adds up to 130 MB and you haven't even started to develop anything yet. Nor do you have any application software on your machine. Let us say you decide to go with Microsoft Office. There goes another 40 MB. You have used up 170 MB of disk space so far. You will need room to develop your software and to install further development tools when they become available. For such a set up a hard disk with a formatted capacity of 512 MB is the bare minimum. With this kind of capacity you would be looking at a SCSI device which will involve the additional expense of a SCSI hard disk controller.

Okay, so you may be working on a LAN in which case the file server would have swallowed the 170 MB of software that

PowerPC Hardware Reference Platform

On Monday November the 7th, 1994, Apple Computer Inc, Motorola and IBM Corporation jointly announced a new architecture for PowerPC processor-based computers. No firm details will be published until the Spring of 1995 so we must apologise for the paucity of hard technical data in this month's article. This is not the first announcement of a 'reference' design for PowerPC-based computers. Prior to this a number of manufacturers had announced products based on the original IBM/Motorola PowerPC Reference Platform ('PREP'). Industry watchers had been concerned when Apple refused to join the PREP consortium and had declined to support the PREP architecture in the Power Macintosh range of computers. The implication of this decision was that the Mac operating system would not be portable to PREP-based computers and that, conversely, operating systems such as Windows NT, AIX, and OS/2 would not be ported to the PowerMacintosh.

Apple was resisting the PREP design this would have created a computer that was manifestly not a Macintosh. PREP is a rather less ambitious platform than the newly announced one. Essential Macintosh features are missing (such as the Apple Desktop Bus for the mouse and keyboard, the built-in networking, advanced AV options and Geoport high-speed serial ports). PREP has been likened to an IBM PC with a PowerPC processor shoe-horned in. The problem with Apple not supporting PREP was that it denied choice to purchasers who wanted the facility to boot other kinds of Operating System. Worse, from Apple's point of view, there was no likelihood that Apple was going to be able to derive additional revenue from licensing the Macintosh Operating System to PREP vendors.

So, what is the new PowerPC hardware reference platform? Technical details are limited at this point and fuller information will be available in the Spring of 1995. In the announcement it was described as being an architecture: 'a frame-

work made up of open technical concepts, definitions, specifications, and interfaces.' The intent is that software and hardware vendors will use it to build PowerPC-based computers that can run applications software which runs on a variety of industry standard operating systems including the Mac OS, OS/2, AIX, Windows NT and Novell's Processor Independent Network ('PIN').

The new architecture combines features from the Power Macintosh platform with the existing PREP architecture, in conjunction with open licenses to deploy the MacOS. See the block diagram of the PowerMacintosh 8100 in Figure 2. This will make it possible, for the first time, for vendors to create legal 'clones' of Macintosh computers. The idea is that computers built to be compatible with the hardware reference platform will be 100% compatible with existing PowerPC-based expansion cards and applications software products. At the announcement it was disclosed that the reference platform includes a high-performance Peripheral Component Interconnect ('PCI') bus for plug-in expansion cards. This helps to confirm previous rumours and announcements about expansion options in future PowerMacintosh computers. There will also be compatibility with existing hardware through 'industry standard' I/O subsystems (such as IDE hard drives) and components, plus an operating system-independent boot mechanism. The first prototype computers based on the hardware reference platform are expected during 1995, after the release of detailed specifications for the platform. First product shipments are unlikely before 1996. So this isn't likely to effect your immediate buying decisions.

So, does this mean that the Macintosh will lose its originality? Will Apple's Macintoshes be drowned under the flood of 'compatible' products that is expected to appear. The Power Macintosh is selling very well; some 600,000 systems in the first nine months. Apple is on track to sell 1 million PowerPC-based Macintoshes in

the platform's first year. On the software front, Apple seems to have in view the possibility of substantial revenues from licensing the MacOS to implementors of the hardware reference platform. It may also sell components such as Apple ASICs ('application-specific integrated circuits') for use in other vendors' computers. Apple does appear to have realised that the company should be able to do much better as a player in a larger market. Concentrating on a manufacturer-controlled niche market (as it does at the moment) may actually limit growth.

Apple should be able to add value to the Power Macintosh without compromising the computer's ability to run software designed for reference open platforms. A question mark remains against Apple as a software marketing company. Much of Apple's hardware sales are driven by the excellence of the system software. However, Apple has been fairly unsuccessful selling software as a 'product'. The one notable exception is Hypercard, Apples best selling software product. I suspect that the company has never really figured out how to make money from software.

The hardware reference platform has considerable implications for developers. At last, it means that the target market for Power Macintosh software is no longer limited to the computers that Apple sells. A 'Power Macintosh platform' has now been defined as any computer running the Mac OS that is PowerPC-based. Apple has stated that properly written Power Macintosh software will run on hardware reference platform-compatible computers from any vendor. Apple has also announced that the MacOS will be openly licenseable. This implies that Apple will also market shrink-wrapped Mac OS packages to sell to any user of a hardware reference platform-compliant computer. Which confirms that the Mac OS looks likely to stake a leading place in the growing population of RISC-based computers.

Paul Smith

would have been on your hard disk. You could then probably escape with a hard disk requirement of 250 MB or 340 MB. This fits well with the domain of IDE hard disk drives. On most new machines today, IDE is the standard so you would not have to pay anything extra.

CD blessings

If you are not blessed with the luxury of working in a file server environment, or you prefer to install your development tools locally then a CD-ROM drive is essential. While it may be a little more expensive, it is worthwhile opting for a SCSI CD-ROM

drive in preference to one with a custom ISA-based interface. The SCSI drive will be far easier to install and is likely to be supported by the widest range of software. Furthermore, if your job involves working with multiple operating systems, a SCSI CD-ROM drive is the recommended method of installation. If your hard disk is a SCSI de-

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vice you will already have a controller suitable for the CD-ROM. Otherwise you will need to purchase one separately. In this case you can choose a low cost 8-bit model, since CD-ROM drives are much slower than hard disks.

Faster Windows

Assuming that your development tools are Windows hosted, then it essential they respond as fast as possible. You already have the fastest processor and masses of free memory. What next? There is a family of video cards known as Windows accelerators which are designed to increase the performance of drawing objects onto the screen. To achieve this they use a dedicated graphics processor. The effect under a GUI such as Windows is that the user interface is updated far quicker than on a standard video card, which utilises the actual system processor to perform the drawing operation. While such cards may improve the responsiveness of Windows-based development tools, they will have no effect elsewhere. For instance, speed of compilation will remain the same. Unless you are planning to develop applications such as real time video, animation or virtual reality which require fast graphics, ultra high performance graphics cards are more of a luxury than a necessity.

Think big

Perhaps the most frustrating criticism of Windows hosted IDEs is that they take up too much screen real estate. It is just not possible to have, say, the class browser, debugger and an immediate window open all

at the same time. Standard VGA at 640 by 480 is no longer practical. The higher resolutions of 800 by 600 or 1280 by 1024 are commonplace now. However, the drawback is that on a 14" monitor, the font appears minuscule. Text becomes very difficult to read, possibly leading to program error. Or the developer is forced to maximise the window he wishes to inspect, obscuring all others.

Almost every IDE will benefit from an upgrade to a larger monitor. Two sizes are available, 17" and 21". The problem is that 14" monitors are pretty much standard on new equipment. Upgrading to a 21" monitor can often be the single biggest contributor to the overall cost of a PC.

Path to hardware utopia

There will come a time when you will have to decide whether it is more economical to buy a new PC rather than upgrade your existing one. Upgrading certainly looks attractive at the onset, since the cost is spread over a long period. If, however, you have decided you will have to upgrade all the components at once, then it is probably better to look into purchasing a new machine. For instance there is no point in starting an upgrade with a 386 machine. It would be more expensive to buy a new motherboard, new memory to replace the slow system memory installed and a larger hard disk, than to purchase a brand new machine outright. On the other hand, if you are starting with a 33 MHz 486 with enough system memory, you could look into buying an Intel OverDrive chip to double the internal clock speed. Such an upgrade will turn your system into a DX2.

Then if you decide you need a new machine, how much are you prepared to spend? If what you can afford does not buy the ideal machine for software development, which features are essential? Determine the bare minimum specifications then list an upgrade path. Essentials are obviously the processor and hard disk since these are the most difficult to upgrade at a later date. Try to obtain the fastest processor and largest hard disk you can afford. Remember to add in the cost of memory and a SCSI adapter if you need one. So do not go for a P90 and 1 GB hard disk if you end up with no money to buy any memory. You will need at least 16 MB to start with. These are the essential components. You may also decide to put down the CD-ROM drive at this point as well. Now consider whether you can live without that 21" monitor. It makes more sense economically to buy it when you purchase the PC as its cost will be offset by that of the 14" monitor which you will no longer need to buy. Finally add the Windows accelerator graphics card.

The price of being best

It should come as no surprise that software developers seem to require the highest specifications of machine. Large SCSI hard disk, lots of memory, fast processor... Doesn't that sound awfully like the spec for a server machine? If you look at the information sheets from some of the major suppliers it certainly is classed as such. Figure 3 lists comparable pricing of six branded machines. But alas, they don't come cheap!

Serious software development needs serious hardware and that costs serious money. Try explaining to the financial director why you need a 21" monitor or a machine which is more powerful than the average LAN server in the organisation. But if you had the money it is what you would buy. Isn't it?

Now there's a point. The tools of a plumber are his own. As long as an agreement could be reached regarding the monetary side of things, it should be possible for a software developer to buy the kit which best matches the way in which he works. A database developer using dBASE for Windows doesn't need the same spec of machine as a C++ programmer. Instead, he could optimise his machine to handle the processing of large amounts of data with a disk cache. Or the developer who enjoys a quick cigarette during the five minute build time, could buy a slightly slower machine with, say, the 21" monitor so that his supervisor could see from the other end of the office that his machine was crunching away in his absence.

AST Manhattan G560 60 MHz Pentium PCI/EISA 16 MB 1 GB SCSI SCSI CDROM £2,995 081 2325000	Dell OptiPlex 560/L 60 MHz Pentium PCI/ISA 16 MB 525 MB IDE ISA CDROM £2,223 0344 720000	Olivetti M482 60 MHz Pentium PCI 16 MB 420 MB IDE ISA CDROM £2,364 0800 447799
Compaq Deskpro XL 566 66 MHz Pentium PCI/EISA 16 MB 535 MB SCSI SCSI CDROM £3,033 081 3323888	IBM PC 330 6575 60 MHz Pentium PCI/ISA 16 MB RAM 540 MB IDE SCSI CDROM £2,774 0345 727272	Elonex PC-560 B/I 60 MHz Pentium PCI/ISA 16 MB 540 MB SCSI SCSI CDROM £1,969 0181 452 4444

All machines supplied with 14" monitor and 3.5 floppy disk drive

Figure 3 - High tech software developers need high tech PCs

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Aware/VBX	£110.00	Borland PowerPack	£69.95	FoxFix Utility	£95.00	Adv. xBase Server (10 user)	£1195.00
Borland Visual Solutions Pack	£59.00	Borland Visual Solutions Pack	£59.00	FoxPro 2.6 Std, DOS or Win	£79.00	Adv. xBase Server (20 user)	£1995.00
Class:VBX	£219.00	C video course	£195.00	FoxPro 2.6 Pro, DOS or Win	£495.00	Adv. xBase Server (50 user)	£2795.00
CodeBasic	£129.00	CA-C++ 3.0a for OS/2	£399.00	Graph4Fox	£195.00	Adv. xBase Server (100 user)	£3795.00
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Crescent NetPak Prof	£129.00	CodeBase++	£235.00	MIX (Single User)	£95.00	Adv. xBase Server (1000 user)	£6495.00
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More than a game...

The games port has been around since the original IBM PC, yet its main use has been for plugging in joysticks. **Michael Covington** shows how it may be used to interface with the real world around us.



If you are fed up with the stack of computer games you got for Christmas or are suffering severe RFI (Rapid Fire Injury) from pressing the red button once too often, then my advice is to unplug the joystick from your machine and take a look inside. Not the whole PC, but the game port itself, which has had no small part to play for your current disposition. A joystick port (games port) can interface with more than just joysticks. It contains an interface through which you can monitor CPU temperature, line voltage, the weather, or a host of other real-world quantities. In this article I'll show you how.

Inside the joystick port

IBM's design for a pair of joysticks contains four variable resistors and four 'fire button' switches as illustrated in Figure 1. Accordingly, one joystick port can measure four analogue quantities and four switch closures. Note that the switches are returned to ground but the resistors are returned to +5V. Be sure not to short +5V and ground together, unless you want to reboot the computer in a hurry and possibly melt some wires in the process.

The switch-closure inputs are simply TTL inputs pulled up to +5V by 1000-ohm resistors. The analogue inputs are more interesting. Figure 2 shows what's inside them. The crucial component is the capacitor, which normally cannot charge because a switching transistor is holding a short circuit across it. In order to take a reading the computer removes the short, then times how long it takes the capacitor to charge to 3.3 volts.

This is the original 1981 IBM PC joystick port circuit. All subsequent PC joystick

ports have worked the same way, with two exceptions. First, a few of the cheapest ports only support one joystick. Second, many newer ports have a 'sensitivity adjustment' that sets the charging threshold to values other than 3.3V. The adjustment is usually a switch or knob, but on some Kraft joysticks, it is a digital-to-analogue converter under software control.

Follow Faraday

The laws of physics ensure that the time taken to charge the capacitor will always be proportional to the resistance (including the internal 2.2k resistor). Thus, this simple circuit gives excellent linearity, just what game players need. The problem is with reproducibility from machine to machine and port to port. The values of the capacitors can vary as much as 10%. So you won't get exactly the same numbers from different game cards, or even different analogue inputs on the same card. More important, precision timing is never easy on the PC. Both Basic and the BIOS routines are affected by minor changes in the software environment. In particular, a program running in a DOS box under Windows will not give the same readings as when running under DOS by itself, because of differences in timing.

Fortunately, you can compensate for these variations in timing, or at least detect them, by putting known resistances across some of the analogue inputs. Then comparing them to the unknown value, rather than trying to take absolute readings. That's also a good way to deal with BIOSes that use different numeric scales for the same range of resistances. Industry uses precision ana-

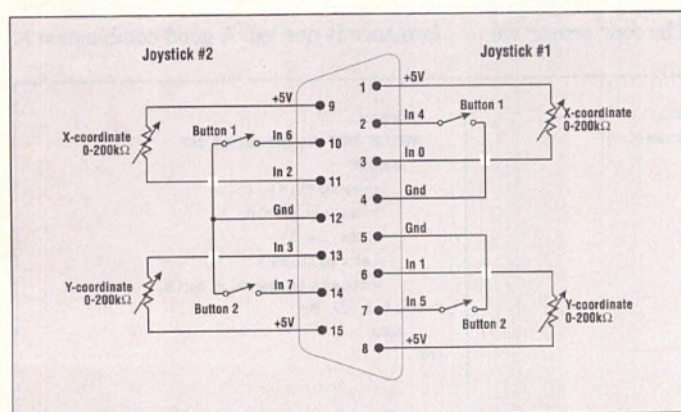


Figure 1 - A PC joystick port can sense four resistances and four switch closures

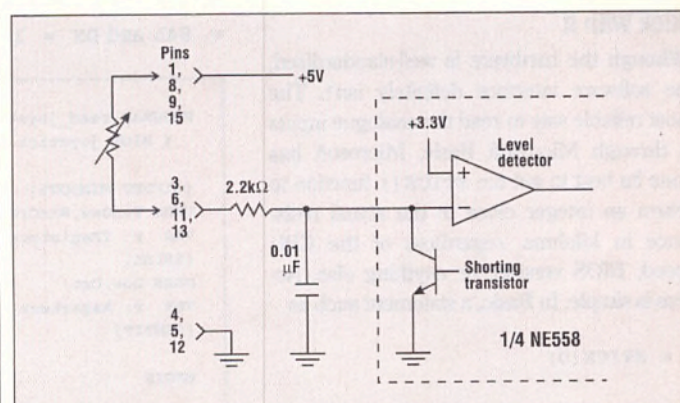


Figure 2 - Charge time of capacitor used to measure resistance


```

' T.BAS (M. Covington 1994)
' Measuring TEMPERATURE with linearized thermistor
'
SENSOR = 0 ' possibilities: 0, 1, 2, 3
'
CLS
PRINT "TEMPERATURE PROGRAM"
PRINT
'
' Calibration
'
PRINT "Calibration needs 2 known values,"
PRINT "preferably near ends of range."
'
OPTION BASE 1
DIM RDG(2), VALUE(2)
FOR I = 1 TO 2
  PRINT
  PRINT "Connect known value "; I; " and press any key..."
  WHILE INKEY$ = ""
    RDG(I) = STICK(0) ' initialize all 4 sensors
    IF SENSOR > 0 THEN RDG(I) = STICK(SENSOR)
    LOCATE CSRLIN, 1
    PRINT "Reading: "; RDG(I); " ";
  WEND
  PRINT
  INPUT "Actual value"; VALUE(I)
NEXT I
'
FACTOR = (VALUE(2) - VALUE(1)) / (1/RDG(2) - 1/RDG(1))
OFFSET = .5*(VALUE(2)-FACTOR/RDG(2)+VALUE(1)-FACTOR/RDG(1))
'
PRINT
PRINT "Factor =", FACTOR, "Offset =", OFFSET
'
' Taking readings
'
PRINT
PRINT "Taking readings continuously. Exit with Ctrl-Break."
PRINT
'
WHILE 1
  RDG = STICK(0) ' initialize all 4 sensors
  IF SENSOR > 0 THEN RDG = STICK(SENSOR) ' take reading
  VALUE = FACTOR / RDG + OFFSET
  LOCATE CSRLIN, 1, 0
  PRINT USING "####.###"; RDG; VALUE;
WEND

```

Figure 3 - A thermometer program

logue-to-digital converters not joystick ports for serious measurement work. But there are plenty of applications for which the limited capabilities of the joystick port are quite adequate.

Stick with it

Although the hardware is well-standardised, the software interface definitely isn't. The most reliable way to read the analogue inputs is through Microsoft Basic. Microsoft has done its best to get the `STICK()` function to return an integer close to the actual resistance in kilohms, regardless of the CPU speed, BIOS version, or anything else. Access is simple. In Basic, a statement such as

```
X = STICK(0)
```

takes readings from all four sensors, and stores the first one into `X`. Then `STICK(1)`,

`STICK(2)` and `STICK(3)` retrieve the values that were read from the other three sensors. The listing in Figure 3 demonstrates this technique.

Another way to read the sensors is through the BIOS, using `INT 15h` with `AH = 84h` and `DX = 1`. The four sensor val-

ues come back in `AX`, `BX`, `CX`, and `DX` respectively. Figure 4 shows how to do this in Turbo Pascal. While experimenting, you can also use Microsoft Diagnostics (`MSD.EXE`) to read the analogue sensors through the BIOS. The problem is, there's a lot of variation among BIOSes. This variation affects only the scale of the numbers: a 100-kilohm resistance may give a reading of 40 on one machine and 180 on another.

The third way to read the joystick port is, of course, to manipulate the hardware itself. In effect, implement for yourself what BASIC and the BIOS are trying to do. I haven't tried this. To do it, output any value (it doesn't matter what) to port 201h, then repeatedly read that same port, timing how long it takes each of the lower 4 bits to switch from 1 back to 0. For a range of 0 to 200 kilohms, the time will range from 24 to 2200 microseconds. For high accuracy, use a hardware timer.

Measuring up

We want to solve the equation $\text{Resistance} = (\text{Reading} \times \text{Factor}) + \text{Offset}$ where `Factor` and `Offset` are unknown until calibration is performed for a particular game card and software environment. Naturally, you can do the calibration once, then save the values for future use on the same machine. The resistance to be measured is connected in place of one of the variable resistors in Figure 1. The joystick port can also measure voltage, by charging the capacitor from the unknown voltage through a known resistance. The charging time is inversely proportional to the voltage. If the voltage to be measured is between 5 and 15 volts, the only external circuitry needed is a single resistor.

Some like it hot

Temperature is especially easy to measure with the joystick port. The trick is to use a negative-temperature-coefficient (NTC) thermistor in series with a resistor whose resistance is about 70% of that of the thermistor at the temperature where best performance is needed. A good combination is

```

PROGRAM read_joystick;
  { BIOS joystick access, }

  {$IFDEF WINDOWS}
  USES WinDos, WinCrt;
  VAR r: TRegisters;
  {$ELSE}
  USES Dos, Crt;
  VAR r: Registers;
  {$ENDIF}

  BEGIN

    clrscr;
    WHILE NOT keypressed DO
      BEGIN
        gotoxy(1,1);
        r.ax := $8400;
        r.dx := 1;
        intr($15, r);
        writeln(r.ax:5, r.bx:5,
          r.cx:5, r.dx:5)
      END
    END.

```

Figure 4 - Reading the joystick port in Windows

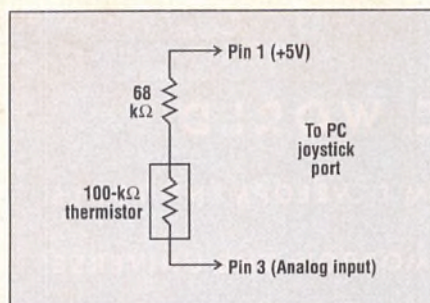


Figure 5 - A PC thermometer

a 100-kilohm thermistor with a 68k resistor as shown in Figure 5. This gives 1F resolution over a range of several tens of degrees. With considerable loss of resolution, you can use a 10-kilohm thermistor with a 4.7 resistor (allowing for 2.2k already inside the joystick port). The resistor 'linearises' the thermistor so that $1/R$ is close to being linearly proportional to the temperature. You can then use the algorithm in Figure 3 to calibrate for Fahrenheit, Celsius, or Kelvin temperature. (Or even Rankine or R_{au}mur, if your tastes run toward the exotic.)

To calibrate the thermistor, bind it tightly to the bulb of an accurate thermometer by wrapping with aluminum foil. Then apply an outer wrap of waterproof plastic and immerse the whole assembly in hot and cold water.

What's this good for? Figure 6 shows one example: a graph of the air temperature in my computer room, measured once per

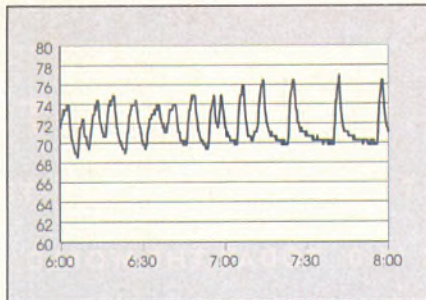


Figure 6 - Graph of air temperature

minute, then graphed with Quattro and post-edited with Corel Draw. This room has a rather large oscillation in temperature as the thermostat clicks on and off. At 7:00, the heat in another part of the house was turned on, changing the waveform but not the amplitude. Another obvious use for a thermistor is to monitor the temperature of an 80486 or Pentium CPU. In this case, calibration may not be necessary. All you need is a relative reading, and a warning if the CPU suddenly gets hotter than normal.

Hello world

The joystick port can measure anything that translates into resistance, voltage, or current - and that means practically anything at all. For instance you could use a CdS photocell to measure light intensity. Calibration is up to you. Humidity sensors, barometric pressure sensors and even potentiometers with weights (to measure position or acceleration) are other possibilities.

Michael Covington does research on computational linguistics and manages the artificial intelligence lab at the University of Georgia. His other interests include electronics, ham radio, and astronomy. This article first appeared in PC Techniques.

Joysticks under Windows

There are two ways to read the joystick port under Windows. The low road is to use the BIOS, as shown in Figure 4. This is more complex than simply issuing an INT instruction in the middle of a Windows program, but Turbo Pascal and Turbo C++ provide routines that do the housekeeping for you (intr and int86 respectively).

The high road is to implement a device driver for the joystick port, supporting the joystick API documented in the Windows Multimedia Reference. A sample is included with the Microsoft Windows Device Driver Kit and has also been distributed separately as IBMJOY.ZIP. As supplied, this driver isn't quite suitable, because it recalibrates itself periodically under the assumption that a real joystick is attached. Still, it could easily be modified to read resistance directly, storing machine-specific calibration information in WIN.INI.

Still More Uses for a Joystick Port

Besides what's already been mentioned, you could use a joystick port to:

- Detect switch closures, tracking the state of a thermostat or burglar alarm, the movement of a model train, or the activities of a trained hamster
- Accept 4 bits of parallel TTL-level data directly, through the switch-closure inputs;
- Use the ON STRIG(n) statement in BASIC to make switch closures trigger event-driven routines;
- Steal 5-volt power from the computer for some other accessory (after all, the joystick port brings out both +5V and ground).

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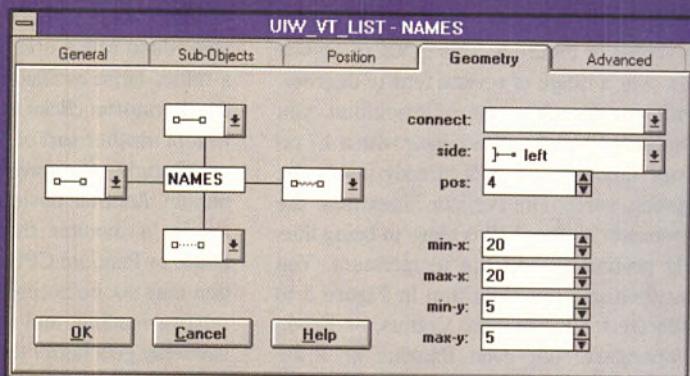
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EXE Compiler report - Part II

In this second  installment of the EXE

C++ compiler report, **Rhea Laboratories** compares two of Microsoft's main competitors.

In the December issue of EXE I wrote about the Microsoft family of C++ compilers, namely Visual C++ 1.5 and 2.0 versions. This month it's time for the main competitors, these being Borland C++ 4.5 and Symantec C++ 6.1. At the time of writing Symantec had announced a version 7.0 release of its compiler so I have also provided a brief overview of the Terminator beta of this new compiler.

Borland C++ 4.5

While I was preparing this article Borland C++ 4.5 (BC++ 4.5) was released. As a consequence I have based the review upon a field test release, code named Matador. BC++ 4.5 is a Windows-hosted compiler for DOS, Windows and Win32. What differentiates the new release from its predecessor is increased support for Windows NT and Windows 95, 32-bit VBX support and a new OCF C++ class library for developing OLE 2.0 applications. Supporters of Visual C++ and MFC could perceive the new compiler as Borland's go at playing the catching up game with Microsoft. But Borland has a devout following. And, in many ways, the Borland compiler is a very different product.

At ARM's length

The BC 4.5 C++ language implementation is based upon the draft ANSI standard and the ARM. Compile time options for C compilation allow you to select strict compliance with ANSI, Unix System V, Kernighan and Ritchie or to enable full Borland extensions. It includes full support for C++ exception handling, as well as a set of C-based exception handling facilities based upon the `__try`, `__except` and `__finally` keywords. C++ programmers will of course generally wish to stay with the ANSI C++ exception commands. Class and function Templates are fully supported.

To take advantage of the multi-threaded environment of NT and Windows 95, Borland extends the language with a 'thread variable' declaration. Unlike the `__declspec(thread)` used by MS a simple `__thread` type modifier is used instead. Pointer variables in BC++ 4.5 cannot

be `__thread` variables and no run-time initialisation is allowed.

Talking segments

Several extensions are included for Intel 80x86 segment-based programming, including `__near`, `__far`, `__huge`, `__cs`, `__ds`, `__es`, `__ss` and `__seg`. The `__seg` prefix creates a pointer to an object with a suitable segment address and an assumed offset of zero. In use, it is implicitly cast to far pointers. However, there is no support for the MS `__based` pointer type. Other MS uses of these extensions are not supported by Borland. These include using `__far` in a non-pointer declaration, to force data explicitly to be in a far data segment, or in conjunction with `new`, to force allocation to be from a far heap. Statements such as:

```
UserData __far *tempUser =
new __far UserData;
```

will fail with a compile-time error.

Other declaration extensions include `__interrupt` for writing interrupt service routines and the now common extensions such as `__cdecl`, `__pascal`, `__export`, `__import` etc.

IDE loves and hates

The source editor is good, with user-configurable key bindings. Designed as a standard MDI application, it is uncluttered and easy to read. I found the configurability of the type and detail of compiler warnings excellent. At its highest level, it showed huge numbers of warnings, several hundred in fact (fortunately in this case harmless) that had not previously been identified by either the MS or Symantec compilers. The problem lay in identifying exactly which message options check box turned off the ones I was getting!

Like the other modern development platforms BC++ 4.5 offers 'syntax colouring', but carries it slightly further, allowing you to specify specific code elements as italic, bold or underlined. Certainly I found the default bold keywords and italicised comments was comfortable and increased readability.

The problem lay in identifying exactly which message options check box turned off the ones I was getting!

The project facilities are good, supporting compound projects consisting of multiple targets, which may be a mixture of types (a Windows .EXE and a corresponding .DLL for example).

Borland has extended the help facilities of the system by supplying its own help engine. This is more configurable than the standard MS help engine and can be extended to search across multiple help files (including your own).

Annoyingly, some of the basic IDE operations, such as add source file to project, appear *only* to be on the toolbar or right-click context-sensitive menu. I could find no corresponding main menu option. This meant that getting to it without the mouse was not very convenient.

The facility for adding items to a project was simple, consisting of a multi-select list box which added the selected items. The user can select which icons are to appear in the toolbar. But the toolbar is fixed at the top (or bottom) of the screen, rather than being a floating, dockable toolbox.

Other tools

I found the browse facilities less convenient than those of the MS or Symantec compilers, partly because every Browse I issued came back with 'EXE not found!'. Like MS, Borland has developed an excellent facility that you can't use until you have a clean compile, by which time you don't need it so urgently. I had to use the less convenient (and slower) `grep` facilities.

The Borland resource tools are available from the IDE by a menu option. It contains all the usual options for editing Windows resource files. Additionally, facilities for Version resources are included.

Borland C++ also provides a full inline assembler. Assembly-language source is written in an `__asm` block, as in the MS or Symantec compilers. When I tried it for the first time it complained of a syntax error in the instruction

```
call DOS3Call
```

which had been accepted by both the MS and Symantec compilers previously. Pressing F1 with the cursor on the call mnemonic found no matching entries in help. Borland's extensions to the help engine needs extending a little further, perhaps. I still haven't managed to find out exactly what it's complaining about, but I suspect that the problem is over-aggressive checking of type modifiers in the assembler.

An example port

In general, the conformance of the Borland library function and data structure names to the corresponding MS names was good (in so far as this is desirable), with a few slips.

Symantec C++ Terminator

During the life of this report, Symantec will launch C++ version 7, currently code-named Terminator. Beta 1, examined for this article, was clearly very early and was not yet particularly stable. It did however allow a view of where the product should be by release. Beta 2 will be covered in detail in the full published report. The beta offers conventional-looking multi-window C++ development system, much like Symantec Version 6.x, but with several new menu options both on the main menu and on the menu of the individual source edit windows. Under the hood though, we are looking at some major advances in usability for C++ programmers.

Terminator indeed

It's a good fast compiler, on a par with 6.x. But Symantec was not satisfied with that. 'You can tweak the code and maybe get an extra 10-15%, but so what,' said Dan Putterman of Symantec. It has gone instead for a *radical* improvement in compilation and project build throughput for network users. Installing Netbuild Supervisor and adding the Netbuild Servers to several machines on a Network, gives you distributed project building. Each compilation is automatically farmed out to a 'spare' machine with sufficient capacity. As many compilations as possible take place in parallel. The result is a massive reduction in time to build large systems.

Power in the parse

The development environment is fundamentally similar to the Symantec 6.1 IDDE. But, the user now has the choice of button size on the toolbars. All the toolbars can be edited and 'docked'. The major new facility of Terminator is the edit-time parsing of source files. This, coupled with a highly integrated set of browsers, editors and class representation/manipulation tools, offers a very sophisticated approach to C++ source editing. It allows you to operate directly on classes, members and methods, without having to worry about the source file structure of the project. And unlike the Microsoft Visual Workbench source Browser facilities (which are in any case not as powerful), the edit-time parsing means that all the facilities are available long before you reach the point of a successful project compilation. Furthermore, the Optlink linker has been substantially rewritten as a multi-thread application and is extremely quick.

Catching up with MS

Terminator includes the full MFC 3.0 class library for Windows and NT development. As in Symantec 6.x, Terminator (at least in current Betas) includes no DOS graphics libraries at all. DOS programmers will still need to contact Flashtek to buy these facilities.

The compiler supports all previous Symantec language extensions as well as the MS language extensions needed for compatibility. Additionally, many MS-defined `#pragmas` are now supported directly by Symantec.

Tooling up

The resource tools have been completely redesigned. Now there is a resource management shell, which brings in a wide range of individual resource editors as needed, all being managed using the OLE 2 in-place activation/editing. Very neat, and technically elegant. The debugger has been extensively rewritten. Symantec appears to have given good consideration to the problems of debugging multi-thread applications. It is possible to 'freeze' and 'thaw' threads individually, or to allow multiple threads to step in parallel and so on. This should make it much easier to identify and fix possible synchronisation problems.

Overall view

Symantec has raised the stakes in the C/C++ market, with a product that shows the potential of delivering significant performance and productivity gains, at an extremely competitive price.

For example, `_locking` does not map to `locking`. Also, while `_dos_findfirst` maps to `dos_findfirst`, it takes a pointer to a `struct find_t`, not to a `struct _find_t`. Such minor differ-

ences, while easy to get round, make porting MS code to Borland more time-consuming than it need be. Borland would be well-advised to look more closely at this area.

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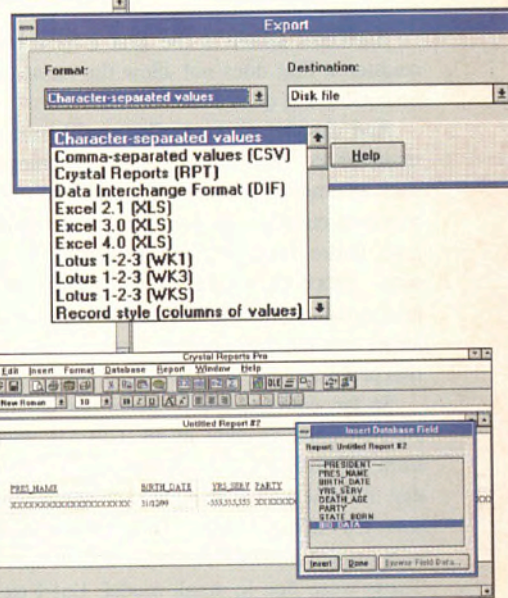
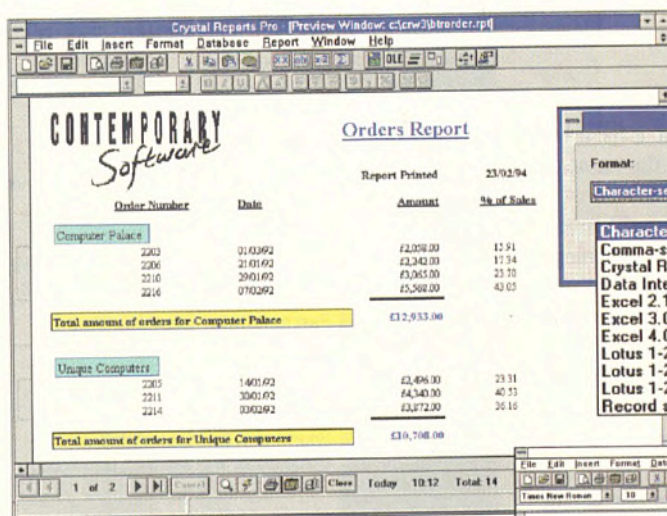
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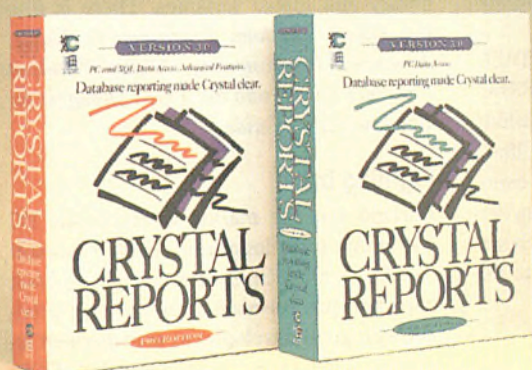
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REPORTS

When I attempted to convert a project from MS to Borland it failed at several points, with errors mainly as a result of language differences. Having finally overcome these, everything compiled cleanly. Except, that is, for the hundred or so warnings! Then it failed to link, with a syntax error on line 1 of the .DEF file:

```
NAME "Latches"
```

Borland's linker is the first I have encountered that does not allow the name to be enclosed in quotes.

And despite my best efforts, with maximum space optimisation, care on things such as function prologs etc, a program that routinely compiles as small model (but only just) under both MS and Symantec fails, with `_TEXT` exceeding 64 KB under Borland small model. It has to be built as a larger model. Aggravating, rather than a real problem.

So far, converting a program containing 201,000 lines of code in 18 .CPP/.H files from MS to Borland has taken about half a day. But the end is in sight. For some reason, it's failing to find the `strchr` and `set_new_handler` functions at link time. These were fine in small model. But I expect I'll track that down fast enough.

How wise?

Borland C++ uses the Borland OWL library (Object Windows Library) rather than the MFC class library as the object oriented framework for the visual API. Integration of the resources to the application is via the ClassExpert, which allows you to select any interface class and any of the Windows messages or class virtual functions, then add a handler for it. Application Expert issues a series of dialogs which allow you to specify the type of application you want to create (SDI/MDI, with/without OLE 2, etc) and will then create a 'standard shell' for such an application.

To catch a bug

The Windows debugging facilities are fine. There's a good debugging tool built-in the IDE, although there is no debug support for threads. So there is no support for suspending and restarting threads and I can see no easy method for viewing values of thread variables for a specific thread.

One nuisance is that you cannot debug a DOS product from the Windows IDE. Yet Borland has decided not to offer DOS IDE. So for DOS work, you're back in the 'bad old days' of a mixture of Windows IDE and the DOS command line.

BC++ 4.5 also has remote debugging facilities via serial port or network and a com-

	Symantec C++ Professional 6.1	Borland C++ 4.5
Description	C++ development system for 16/32-bit DOS, Windows, Win32s and NT applications.	C++ development system for 16/32-bit DOS Win32
Price	DOS X32-VM DOS Extender £150.00, £100.00 (with voucher) FlashView debugger, £150.00, £100.00 (with voucher) Flash Graphics library, £150.00, £100.00 (with voucher) Any two of the above, £275.00, £200.00 (with voucher) All three products (combo order), £400.00, £275.00 (with voucher)	£349 £99 £149 competitive products upgrade
Support	Free telephone support	----
Network Support	Supports Standard NETBIOS networks for remote debugging.	Network support for remote debugging
Contact	Available from dealers Telephone 0628 592222, fax 0628 592393 Flashtek Tel 0476 74108, fax 0476 6138	Borland 0734 320022
For	Fast compilation speed. It's robust, competent and easy to use Template support Remote RS232 serial and Network debugging. Source of all libraries included Compatibility with Microsoft fair to good	It's robust, workmanlike, and easy to use OWL applications are more portable to OS/2 than MFC Browse facilities are excellent, but only available AFTER a clean compilation Royalty-free 32-bit DOS Extender. It's robust, attractive, and easy to use. Template support Exception support Remote RS232 serial and Network debugging.
Against	Tends to lag MS products in Windows support No exception handling MFC classes only at release 2.0 No DOS graphics library included. Browser facilities less sophisticated than MSVC1.5	It isn't Microsoft No MFC Classes, you have to use Borland's own OWL libraries. Browser facilities not available until after clean build.

Figure 1 - Summary of Symantec C++ 6.1 and Borland C++ 4.5

prehensive range of other debugging aids, including Turbo Profiler, Turbo Profiler for Windows, Winsight and WinSpector. Winsight is a tool which shows the relationships between all active windows on the system. WinSpector is a 'Dr-Watson' type Windows error logging tool.

Installation

Borland BC++ 4.5 was supplied on CD-ROM. A standard installation here was just short of 85 MB, although as with most modern C++ compilers there was an option to install the minimum of files to the hard disk and run most of the compiler, help, etc, directly from the CD-ROM.

During installation, the Borland INSTALL program changed the path in AUTOEXEC without giving me any choice. I really dislike that, as I have to use many products at different times. Frequently the PATH limit is overrun when programs change it. I prefer to set up batch files for different products which set up the environment correctly. It's easy to fix of course, but annoying.

Documentation

The manuals we had on review were for 4.0 4.5 itself arrived on CD without manuals

fairly late in the project. The 4.0 manuals however are comprehensive and fairly readable.

The *Programmer's Guide* discusses language structure, advanced programming, class libraries and the ANSI C implementation. The *User's Guide* covers command-line tools, Project Manager, IDE, AppExpert, Integrated Debugger, Resource Workshop and Class Expert. The *DOS Reference* is a guide to DOS Programming techniques, the DOS Run-time Library and Graphics Functions. The *Library Reference* lists cross-references, run time support, the run time library and global variables. There is also the *Object Windows Programmer's Guide*, *Advanced Programming*, *Object Windows Reference Guide* and the *Turbo Debugger for Windows User's Guide*.

Fighting back

Borland was the market leader in the PC C++ arena for a long time. Then Microsoft decided to move in. Borland is fighting back hard and has released an interesting product with good development management facilities, with DOS, 32-bit extended DOS, Windows and Win32s all in one box.

But it doesn't look closely enough at



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what the rest of the market is starting to do. Some of you will no doubt be disappointed that I have not allowed myself to be drawn into the debate on the relative merits of OWL vs MFC here. Hopefully, that's due to be a whole series in itself at some point...

Symantec C++ 6.1

Symantec's current main PC market offering is a full-featured development system for DOS, Windows and Win32s/Windows NT. It followed very quickly after Symantec's launch of the version 6.0 product, leading many to argue, with some justification, that it was primarily a bug fix. Nevertheless there were some key new features in release 6.1 that qualify it as a full technical release, not the least of which is the inclusion of the 32-bit Microsoft Foundation Class (MFC) library. This greatly simplifies the job of writing applications that are portable over Windows and NT.

Speed demon

I found performance excellent. The machine I ran it on was a 486/50 under Windows for Workgroups 3.11. The compiler was run from a double-speed CD-ROM. There was no 32-bit file access but I set up a large SMARTDRV cache covering the CD-ROM. With this configuration a debug compile of a small Windows application took only about one third the time of the same compilation with Microsoft Visual C++ 1.5 in the same environment. But if you do not have enough RAM for a large SMARTDRV cache, you are likely to want to install more of the system onto hard disk. I have not yet compared 'final release' optimised compile times or execution speeds.

But no exception...

Symantec 6.1 includes full template support, but ANSI style exception handling is not supported. The Symantec compiler supports the majority of language extensions defined by Microsoft in MS VC 1.5. These include `__near`, `__far` and `__huge`. However, it does not include `__based` or `__self` modifiers. Instead, it provides the less versatile but more explicit `__cs` and `__ss` modifiers for specifying that the object defined is in the code segment or the stack respectively. Symantec 6.1 also defines the `__handle` modifier, which provides simplified access to EMS memory.

Shame about the toolbar...

The Symantec compiler is still obviously a descendant of Zortech C++ that the company bought a couple of years ago. But it has been extensively reworked. In fact, the Windows support no longer bears any resemblance to the Zortech product at all. The

compiler comes with a full Windows-hosted development and debug tool suite called IDDE (Integrated Development & Debugging Environment). This is a multiple window environment like Microsoft Visual Basic, rather than a standard MDI application like Visual C++. It's neat. But, like Visual Basic, unless it's the only application on screen, I found it visually confusing and hard on the eyes.

The IDDE has a standard filing-tabbed bar along the top that provides for up to five 'Workspaces'. These are essentially different standard window arrangements for your project. The Microsoft Visual C++ 1.5 environment only allows three. These extra ones can come in quite handy.

One nuisance is that you cannot debug a DOS product from the Windows IDE

Quite a lot of the Symantec IDDE is drag and drop. By dragging a view icon from the view toolbar into the desktop, it expands into a window showing the requested view. I quite like this. But I can't say the same about the edit toolbar. Instead of a ribbon running along the top or down the side of the current edit window, or the application's main window where God (or perhaps that should read Microsoft) intended it, there is a separate rectangular block. It is free-floating and applies to whichever text window is currently selected. Still, free-floating toolbars seem to be the current fashion. But the Symantec 6.1 bars will not 'dock' like those of Word or MSVC 2.0. Drag them to the top of the screen, and they still sit there, as rectangular blocks. The IDDE does not have the sophisticated browse facilities of Microsoft Visual C++, although the SuperFind option does allow searching across multiple source files.

One good feature of the product is the ability to have compound projects. These are projects which are made up of sub-projects. This makes it fairly straightforward to produce applications which contain more than one EXE or DLL component, making it much easier to develop 'real' applications.

32-bit but no OLE

The main big new feature of this 6.1 release is the inclusion of the 32-bit version of the Microsoft Foundation Classes for Windows. From the same source you can now gener-

ate MFC applications for 16-bit Windows 3.1x, Win32s and Windows NT. I suspect some 'leading edge' programmers may be a bit disappointed. The MFC class library is only release 2.0, not 2.5. The sexy new stuff for OLE 2 is absent. And you cannot use the MFC to create the thread code of an NT multi-thread application. This level of MFC is non-reentrant.

MS compatible

Symantec's 6.1 C++ (SC 6.1) is essentially a minor upgrade from 6.0. However, a number of new features have been added to improve compatibility with Microsoft C++. One significant new addition in 6.x is support for `__interrupt` functions, which should simplify writing libraries that are portable between Microsoft and Symantec C++. Another welcome addition is the inline assembler, with similar syntax and semantics to the one in MS VC 1.5, although there is a small bug in it. In order to reduce errors, Symantec has separated the name space for `JMP` labels from other labels. But it has been overdone. So code such as:

```
unsigned long reboot =
    0xf000ffff0ul;
jmp [reboot]
```

will generate a 'missing label' error. It should not, and does not under MS VC 1.5.

There is one continuing minor aggravation with the Symantec 6.1 libraries, from the portability point of view. This is that Symantec has implemented as macros, several routines coded by Microsoft as functions. Many of the `__dos_XXXXXX` functions are implemented this way.

This means that programs linked using Symantec-supplied functions to Microsoft libraries, such as `ver1.lib` and `lzexpl.lib`, will fail during the link process. The libraries cannot see the `__dos_XXXXXX` functions. To get round it, you need to define a set of short wrapper functions. These are each given the 'full' name, with the leading underscore, and call their respective equivalent Symantec functions without the leading underscore in the name.

Keeping them as functions rather than `#defines` and using `COMDEF` records to map them to the Microsoft namings, would be preferable. This would be similar to the way `OLDNAMES.LIB` works in MS VC 1.5.

Another minor 'gotcha' that may hit programmers converting C++ code from Microsoft to Symantec appears to be a possible different interpretation of `__cdecl` when applied to variables, as opposed to functions. I have had problems with constructs such as:


```
int __cdecl
  szName[TITLEBARNAMELEN];
```

when linking to a Microsoft library (SCRNSAVE.LIB for example). LINK failed, unable to find labels that were there. The problems were solved by surrounding the definition (or definitions, or a whole header file) with an `extern "C":`

```
extern "C"
{
  int __cdecl
    szName[TITLEBARNAMELEN];
}
```

but there was no evidence in the MAP files of any difference in the name mangling of `szName`, between SC 6.1 and MS VC1.5.

Into the Blue Sky

Two resource kits are included. The first, the Symantec Resource Toolkit, is a fairly standard Windows resource kit, allowing you to create and edit menus, icons, dialog boxes, accelerators, bitmaps etc. The second is Blue Sky Visual Programmer, a richer kit altogether. Using it, not only can you design the resources, you can also specify how they interrelate. For example, you can specify that a particular menu option is to trigger a corresponding dialog box. You can then 'test view' the resource set, with all these relationships working as they will in the final application. Visual Programmer can then generate the skeleton source for the application. Other controls and resources can be tied to user-written code.

Visual Programmer is not inherently tied to generating MFC-compatible source. A 'Switch-In Module' to Visual Programmer specifies what type of source generation is required. The Symantec package includes the MFC C++ SIM; other SIMs available include ANSI C, Borland OWL and OS/2 Presentation Manager.

Fasts, 'cute' linker

Two linkers are included. LINK386 is used for linking the DOS Extended 32-bit programs. The main one is an enhanced version of Optlink. Symantec acquired Optlink earlier this year. Optlink is a pretty quick, one-pass linker, with a number of extra features, including recursive elimination of dead code and unreferenced global variables. It also claims to be able to make the `MakeProcInstance()` and `FreeProcInstance()` functions superfluous for Windows programmers. This is cute, but if you like your source code to be portable it's perhaps not such a good idea.

Flashtek add-ons.

Like the earlier Zortech compiler, Symantec C++ 6.1 includes a cut-down royalty-free version of the Flashtek 32-bit DOS Extender. It allows you to build 32-bit DOS applications that will run under DPMS, VCPI or XMS memory managers. However there is no ability to debug such 32-bit DOS programs. If you seriously want to do 32-bit DOS development, you almost certainly need to get the full Flashtek X-32 DOS extender and FlashView debugger. The X-32 Extender is a later version than the DOS extender bundled by Symantec. Flashview is a compatible 32-bit debugger.

Cute, but if you like
your source code to
be portable it's
perhaps not such a
good idea

From release SC 6.0 onwards, Symantec has also omitted the Zortech flash graphics library. It has not replaced it with anything. If you need to do graphics work under DOS, you will need to make another call to Flashtek. At least the voucher included in the Symantec box gets you a discount on the price of the library...

Bug finding

The Windows debugging facilities seem to be excellent. Local debugging of an application in a Window is supported of course, but so is remote debugging over RS232 or a NETBIOS-based network. DOS debugging is based on the Periscope debugger, again with local debugging and remote debugging over RS232 or Networks. The one disappointment is, as mentioned above, you cannot debug 32-bit DOS extended applications without adding the Flashtek tools.

Installation

Symantec C++ Professional is supplied on 3" floppies and CD. You can install it to your hard disk from floppy or CD, or you can run it directly from the CD-ROM drive. A typical installation to the hard disk is likely to require take about 60 MB of disk space, although the INSTALL warns of requirements of up to 90 MB. If you run the compiler directly from the CD, you can get away with only about 10 MB of hard disk space for miscellaneous DLLs, etc. You can cut this down even further if you do not install the sample sources.

Documentation

Well, the arrival of another set of manuals to read through is always interesting. This one is 13" thick. Ten inches of that, though, is the rebadged Microsoft documentation for the MFC Foundation Classes and Windows API. The remaining six manuals are *Getting Started Guide*, *User's Guide & Reference*, *Compiler & Tools Guide*, *Run Time Library Reference*, *Visual Programmer User's Guide* and the *MFC C++ SIM User's Guide*.

But before you use the system, you must look at the README files. They contain a list of about 50 functions and global variables that are in the manual, but are not yet implemented. Many of them are synonyms for functions that do exist (`delay` is not implemented, but `msleep` is, for example), and can readily be handled by macros or one-line inline wrapper functions. Most of the others are related to time-zone handling, which many PC programmers tend to forget about anyway. The workarounds for the rest should not be that onerous.

As with most current C++ development systems there is comprehensive online help. However not all of it is as context-sensitive as, say, the Microsoft product. Pressing F1 while the cursor is over the `__asm` keyword, for example, does not actually bring up help on the inline assembler. You have to search for it. Help for the library functions, Windows API functions etc is context sensitive.

Not too negative

When you sit down to write about a product you're seriously using, it's easier to concentrate on the problems rather than describe the good points. It is consequently easy to give a negative impression of a product that really doesn't deserve it. This is one such product. In reality, Symantec has produced a versatile, high quality C++ development system. It is well documented and provides the programmer with all the major tools he needs for development of DOS, Windows, Win32s and Windows NT applications. Serious DOS programmers will, however, want to get in touch with Flashtek.

Coming next

Well that is all for now. I complete the EXE Compiler Report next month by covering several of the less prominent players in this market. These will include compilers from Watcom, MetaWare and Topperspeed. ■

This article is based on a special report commissioned by EXE magazine and produced by Rhea Laboratories. The full report is priced at £35 for the Technical version and £70 for the Management version. Ring Suzanne Chamberlain on 071 287 5000 for details.

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The Future of C

C is a living language.

Francis Glassborow



gives his thoughts on the possible evolution of the C standard.

Preparations are now underway for work on a new standard for C. There are those who believe that this next version is already being standardised as C++. However, I do not believe that C++ is C any more than C is B or BCPL. Many of the problems being encountered in writing a standard for C++ arise out of the attempt to perpetuate an overly tight relationship between the two languages.

It must have crossed the minds of most of you that an attempt to derive a large multi-purpose language with fairly strong typing from a minimalist, relatively low level, language with weak typing is inevitably fraught with difficulties. It is time that the logical development of C in its own terms was continued. International standards are generally reconsidered on a 10 year cycle. By starting now we will be just about on schedule for producing ISO C 1999 in five years time. WG14 has started considering a new mandate to develop C9X.

Think parallel

We should consider the underlying concepts of the design of C and how to re-implement them in terms of the probable hardware resources of the first decade of the next century. I have discussed parallel computers and processing with a number of experts working with such hardware. They opine that the time has not yet come for a fully specified general purpose C for multi-processor systems. On the other hand they agree that such hardware resources will be as common next decade as floating point units are on today's machines. They also agree that some support for parallel processing could be advantageous.

Without any form of direct support for floating point arithmetic, C would be considered of limited and specialist use. It is my belief that the same will apply to languages of the next decade in the context of parallel processing. If the hardware provides multi-

ple processors then the language should provide at least minimal support for programmers to express their intentions in such environments.

I have in mind two simple extensions to C which could be implemented now with very little difficulty. These would both allow programmers to express their intentions and support compilers in making better use of existing hardware.

The two extremes can already be catered for. Multi-threading allows large scale parallel processing. To take advantage of it we need re-entrant library code. Very low level, machine level, optimisations allows some scheduling in multiple pipeline environments. Such support is transparent to the programmer. What we need is an intermediate level where a programmer can take responsibility for both Multiple Instruction Multiple Data (multiple independent processors) and Single Instruction Multiple Data (array processors) architectures.

Towards concurrent data

What is needed is a program construct that will allow developers to inform the compiler that a certain set of instructions can be carried out on several data sets in parallel. Something like:

```
for
(x in { list of elements })
{
    /* code to be applied */
    /* simultaneously to */
    /* all elements in the */
    /* data set */
}
```

The *x* in the above might be an aggregate type such as a *struct* or an array. If you only had a single processor available such code should still compile. The advantage comes when array processors are available because you could then use appropriate algorithms to make efficient use of the hardware.

Register philosophy

There are many cases where the programmer knows that evaluating several expressions in parallel is risk free but the compiler may not be able to make such decision. What I have in mind is that we should provide some support in the same philosophy

as that which motivated the *register* keyword. Before C++ perverted it, *register* allowed a programmer to express an opinion that a register could be used and to inform the compiler that the address of the variable would not be needed. C++ changed this by removing the bar of taking addresses of *register* variables.

We could introduce a keyword *parallel* which would allow individual substatements to be evaluated in parallel. For example:

```
x=parallel(f(/* arguments */)
          +g(/* arguments */));
```

would authorise the compiler to dispatch the evaluation of *f()* and *g()* to separate processors.

The second use for *parallel* would be to support compact multi-threading with something such as:

```
parallel {
    /* list of statements and */
    /* compound statements */
}
```

Of course the use of *parallel* would initially place a substantial responsibility on the shoulders of the programmer. The programmer would need to know that the specified code could be executed in parallel.

Checking the programmer

The pay-off for providing specific support will come from many directions. Programmers will be able to express their intentions. This will assist both the compilation and future maintenance of such code.

What is less immediately obvious is that tools to check that a programmer's decisions were correct would rapidly become available. Once we can point to areas where we believe that multi-threading is possible then a tool could be produced to statically check our opinion.

The support for SIMD is probably much more important because in this area programmers can often select an algorithm that will work safely on an array processor if one is available. Once we have the language to express such intent we can even provide alternative code which would execute more efficiently on a single processor machine.

Unless C develops to support our use of the underlying hardware it will fade away. Some people describe C as a high-level as-

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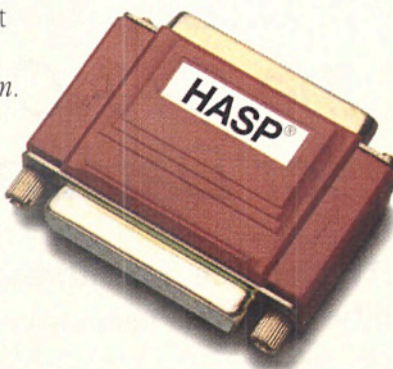
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sembler. I believe this is not only a valid view but, in the long term, is one of C's great strengths. But assemblers must support hardware facilities.

A new standard library...

There are other issues besides supporting the functions that will provide new hardware. For instance, we should consider a new internally consistent standard library that defines performance characteristics as well as interfaces. For example, `qsort()` is a very poor function because it only defines an interface and fails to tell the important things that we need to know about a sorting function. Unless we know which algorithm is used we cannot determine if it is appropriate to the application's data set.

To produce high quality code we need to know what criteria were used in developing third party code. It may be that such criteria do not belong in a standard but they should be considered before being dismissed.

Weighing the restraints

When looking at candidates for a standard library we must remember that one of the primary criteria for such elements is that they can be implemented on all but the most eccentric hardware. For instance, however attractive is `getkey()` (ie raw keyboard

input), the cost of implementing it in many multi-tasking environments is unacceptable.

Personally I would be in favour of producing an entirely new standard library with all items defined from scratch. I can imagine the looks of horror on some faces at this suggestion. If your first reaction is along such lines try to step back from your prejudices and think about the problems new programmers have with our current Standard C Library.

Modules

The second thing I would like to see carefully considered is introducing a module system into C. I do not want to see classes, object or inheritance but I would like to see modules with both explicit import and export of identifiers.

Such an extension would greatly enhance our control. While we can get much of the functionality from using `static`, this relies on a rapidly dying view of programs as being composed of files.

Dead ends

Of course the extensions we described are not the only possible way to make C evolve. One proposition comes from those that would like to see no more than a minimal maintenance release. They believe that we

should tidy up the language and add things that were missed or deliberately left out in writing the current standard and leave all else well alone.

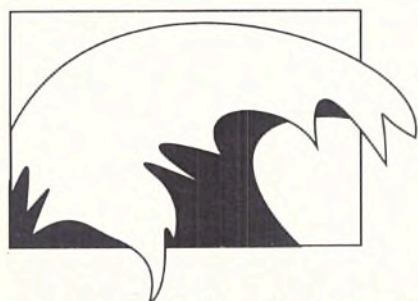
Then there is the opposite extreme from those who believe that the next version of C should be a tidy well defined C++ like language, only slimmer and without the bells and whistles. Perhaps something like Objective C with some ideas from Eiffel thrown in?

Those who favour the first of these alternatives are choosing a direction that will cause C to wither and die. Those who take the second option are being unreasonable. Their efforts should be devoted to producing the best possible C++ and not wasting effort on a rival production.

Any other ideas

So, I have thrown a few ideas here. It would be a mistake to focus on the specifics of implementing such ideas at this stage. What I hope is that many of you will provide a thoughtful critique of the ideas themselves as well as contributing some of your own.

For further information about ACCU write to Francis Glassborow, 64 Southfield Road, Oxford, OX4 1PA, ring 0865 246490 or email francis@robinson.demon.co.uk.



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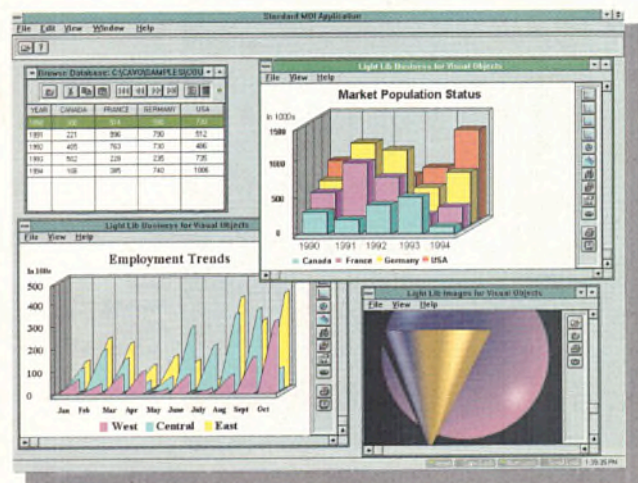
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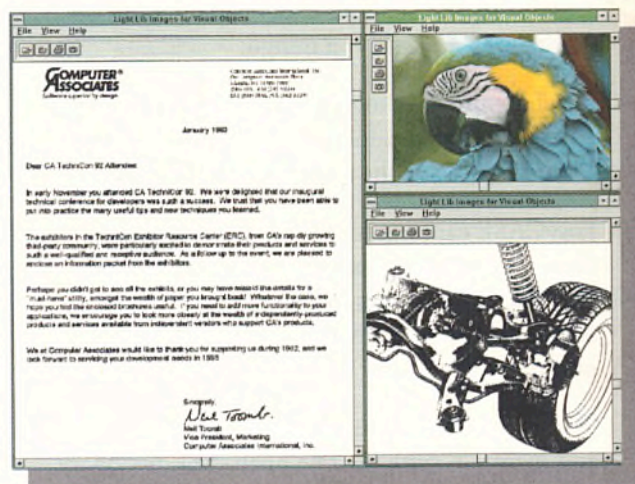
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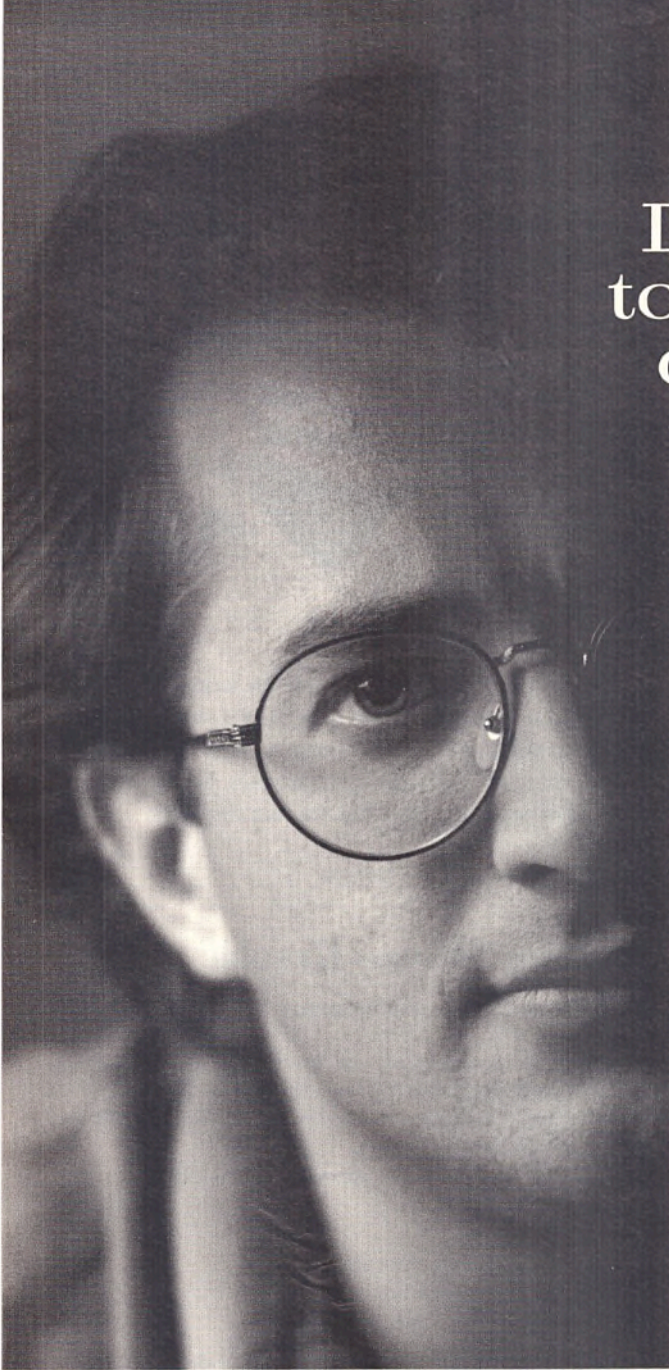
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The seventh seal

Has IBM tamed the beast in DOS? **Michael Price** gives a sneak preview of PC DOS 7.0, possibly the last independent version release of DOS ever...



Some observers think the prospects for DOS are not too bright. Novell has all but thrown in the towel and Microsoft is planning no more releases of a standalone DOS, once Windows 95 becomes available. So how will you support applications that don't need Windows facilities? What will happen with all those machines that do not have the resources to run Windows 95? The answer may be the new version 7 of PC-DOS, designed for all types of IBM compatible machines, currently undergoing extensive testing. Hopefully it will shortly be shipped on new PCs and available as an upgrade for existing ones.

We take a look at the pre-production version and pick out some of the features that will be of particular interest for standalone DOS, or for existing Windows 3.x applications. This is the second release of PC-DOS since Microsoft and IBM terminated their code sharing agreement. There are numerous changes and additions, but no great parting of the ways. This is still the DOS we have all come to love and hate. Stringent efforts have been made to retain compatibility. Mindful of its OS/2 stable mate, the new release of DOS sports an Interlink that can be used with OS/2 2.1 and OS/2 Warp. The OS/2 REXX programming language tool has also been ported to DOS, as an integral part of the system. It is here that we begin.

From life on the mainframe

PC-DOS 7 contains the DOS implementation of the REXX language (see EXE September 1992) that began life as a procedure language for the mainframe VM CMS system, but is now found on machines as diverse as Unix and Atari. In DOS, REXX programs assume the .BAT file extension.

The DOS kernel is changed to recognise a batch file as a REXX program, if the first two bytes of the file are '/' (the beginning of a REXX comment). You can run REXX programs prepared for other platforms, as long as they do not rely on platform specific components, by executing REXX explicitly. For example, the OS/2 TRIANGLE program from EXE September 1992 runs unchanged when you enter `REXX TRIANGLE.COMD`. REXX is a good vehicle for developing support and maintenance functions, especially for one-off requirements and as a mechanism for linking applications. It is particularly useful for developing installation routines, since it is so easy to make last minute changes to the setup that always seem to be necessary as an application nears completion.

Love triangle

In traditional EXE fashion, the language is illustrated via solutions to the triangle problem. The first solution is very straightforward (see Figure 1). The `SAY` instruction puts information onto the display. `PULL` is used to get and parse the input string. `IF/ELSE` instructions are used to compare the lengths. No variable declarations are required, since REXX deals only with strings, which are processed as character or numeric, according to the content and the context. Precedence between logical and arithmetic operators is natural so no parentheses are needed in the tests. Since the comparison will be numeric, entering lengths of `4E2`, `400`, `0400` will give an equilateral triangle. The numbers will be seen to be equivalent. Leading zeros or different forms do not affect the result. The `==` operator on the other hand would compare strings as entered, so would treat the values shown above as different.

The second solution requests lengths separated by commas and a parsing template (see Figure 2). The built-in `MAX` and `MIN` functions classify the lengths. Note that variables can take the same name as the functions. There is no confusion, since function names are always followed directly by parentheses. The `SELECT/WHEN` construction is used to stack the options, giving a clearer picture of the logical flow than you get from the `IF/ELSE` version. In either example the lengths could be input as param-

```
/* Triangle Problem */
/* DOS REXX */
say 'Enter three lengths (format a b c):'
pull a b c
say 'Triangle entered: ' a b c'
if a>b+c|b>c+a|c>a+b then say 'This is not a triangle'
else if a=b&b=c then say 'This is an equilateral triangle'
else if a=b|b=c|c=a then say 'This is an isosceles triangle'
else say 'This is a scalene triangle'
```

Figure 1 - The triangle problem

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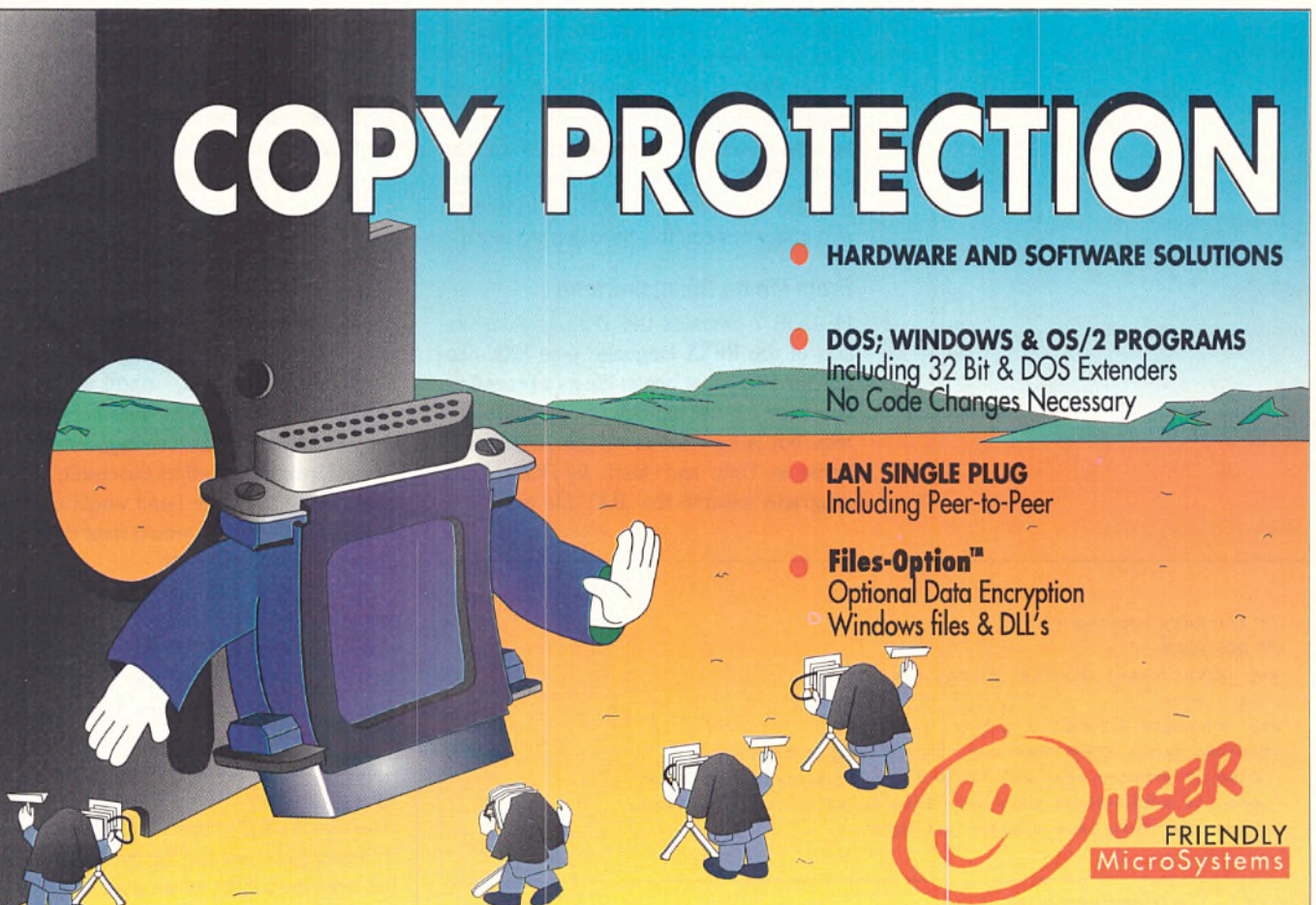
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```

/* Triangle Problem */
/* DOS REXX */
say 'Enter three lengths (format a,b,c):'
pull a ',' b ',' c
max = max(a,b,c)
min = min(a,b,c)
mid = a+b+c-max-min
say 'Triangle entered:' max mid min
select
  when max>min+mid then say 'This is not a triangle'
  when max=min then say 'This is an equilateral triangle'
  when mid=max|mid=min then say 'This is an isosceles triangle'
  otherwise say 'This is a scalene triangle'
end

```

Figure 2 - An alternative solution to the triangle problem

ters. Then the **Arg** instruction would be used to parse the input source string.

Working with DOS

You can execute standard DOS commands in a REXX program. REXX passes the command to **COMMAND.COM**, which processes the command and gives a return code back to REXX. REXX can also generate external functions to replace or extend the DOS commands (see Figure 3). Since DOS itself does not have any equivalent to DLL or NLM support, these additional functions must be provided as standalone utility files, which are **CALLED** and return their findings in the **Result** variable (or you can use them as functions).

In PC-DOS 7 there are a number of DOS commands which have been replaced by REXX utilities. The reason is that these are more suitable for batch operations since they issue return codes and are often faster than their DOS counterparts. There are REXX utilities to control the cursor and position text output on the screen, system and file utilities and a useful **RXSLEEP** utility that provides a timed pause.

Home made REXX utilities

REXX allows you to create utilities for functions not included within the DOS implementation. It provides a 256-byte buffer for result information (see Figure 4). If the utility requires information to be passed back to REXX you must get the address of the buffer from the parameter list. The address must be converted then used to store data. The extension of **.RX** is used for executables that require the result buffer. This enables REXX to differentiate between utilities and other callable routines.

Any application can create a command environment and utilise REXX programs, for example as macros. However, you must take into account the real memory used by REXX itself. The interpreter takes up approximately 160 KB which must all come

from conventional memory. This means that your applications may need to free up conventional memory before invoking REXX.

Carefree memory

Along with the inclusion of REXX, PC DOS has been improved in a number of other ways. As expected, in terms of memory management, IBM has worked to reduce the footprint of the operating system. Savings have been made in most device drivers and TSRs, including **DISPLAY**, **RAMDRIVE**, **SMARTDRV**, **MOUSE** and **ANSI**. **HIMEM** has a new **/FastA20** switch, while **IBMBIO.COM** stores code in the HMA and dynamically allocates data as needed. The new **CONFIG** command **DOS-DATA=UMB** moves the system tables to upper memory. **IBMDOS.COM** reduces kernel data areas by deleting unused data.

MSCDEX.EXE is also optimised. It also move its buffers to EMS memory.

Another memory optimisation concerns **COMMAND.COM** which now stores data in its transient portion. The new switch **/H** moves code and master environments to UMB. The **EMM386 MoveXbdahi** switch loads the eXtended BIOS Data Area into upper memory. And **DOSKEY** loads most of its code in the HMA.

To help take advantage of the extra memory, **PC-DOS RAMBOOST** provides dynamic configuration monitoring and supports the multi-config feature. While many of the facilities assume a 386 processor or better, **PC-DOS** does include some memory management aids for suitably equipped older machines.

Protected species

The **DPMS**-enabled device driver moves part of the driver code into extended memory and runs it in protected mode. This leaves only a small footprint in low memory. **DPMS** does this by providing a set of functions in a server, similar to a **DPMI** server (see Figure 5). These functions include real-to-protect and protect-to-real mode call-up and call-down services as well as allocation and management of descriptors. **DPMS** installs itself into the **Int 2Fh** chain. It is via this interface that the client accesses **DPMS** services.

If you plan to modify your device drivers for **DPMS** enablement you must make sure that the program will still load in real mode if necessary, in the event that the **DPMS** server failed to load for some reason.

RxChDir	Changes the current directory
RxChDrv	Changes the current drive
RxCreat	Creates the specified file
RxDel	Deletes the specified file
RxGetDir	Returns the current directory
RxGetDrv	Returns the current drive
RxMkDir	Makes a subdirectory
RxRmdir	Removes a subdirectory
RxCls	Clears the screen.
RxCrStat	Sets the cursor state
RxGetKey	Reads a key
RxGetPos	Returns the cursor position
RxScrSiz	Returns the screen size in rows and columns
RxSetPos	Sets the cursor position
RxWrScr	Writes text directly to the screen.
RxDinfo	Returns information about a specified drive
RxDosVer	Returns the DOS version
RxFinfo	Returns information about the specified file
RxGetMem	Returns information about the amount of free memory available
RxIsDir	Indicates whether the file name is a file or a directory
RxNetDrv	Checks if a drive is local or remote
RxQsys	Returns the specified system information
RxSleep	Pauses a REXX program for a specified time interval.

Figure 3 - The RX utilities in DOS REXX

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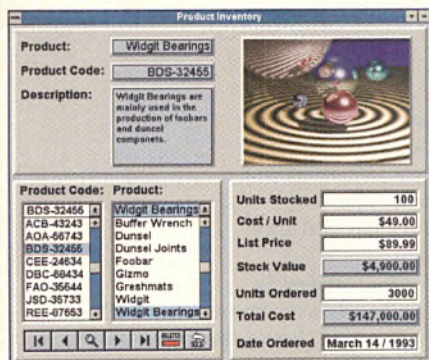
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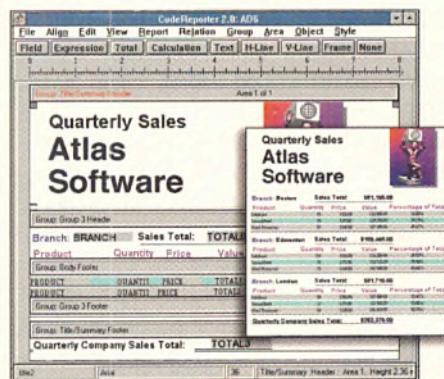
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```

/* Program - ownutil.c*/
#include <stdio.h>
#include <errno.h>
#include <string.h>
main (int argc, char **argv)
{
char far *buffer;
int var1,var2;
/* Check for valid number
/ of parameters */
if (argc !=4)
return(40);
sscanf(argv[1], "%p",
(void far *)&buffer);

/* Code to perform the
/ required task */
/* Return buffer information
/ to REXX */
sprintf(buffer,"%d
%d",var1,var2);
/* Set good return code */

return(0);

```

Figure 4 - How to provide your own RX utilities

While Stac and IBM make use of DPMS, it is supported and licensed by Novell. The Novell SDK includes server code, header and include files. There is also a test application called DPMSTEST. This is a modified version of EMM386.EXE with built-in DPMS support and a sample application (a DPMS-enabled VDISK driver). Novell also provides support through the Novell professional developers programme with its private Compuserve forum.

Warp factor

One feature of PC-DOS 7 is that when it is installed on an OS/2 system, it will automatically prepare the system for Dual Boot. Both systems will then be available on the C: drive. You switch between them by rebooting the machine. The OS/2 BOOT.COM program, which runs under DOS as well as OS/2, copies the appropriate system files, boot record and startup files to restart the system. Alternatively, you may use the OS/2 Boot Manager. This program is stored in a separate 1 MB primary partition on the first hard drive. It provides a menu of operating systems on the machine, so that you can select the required system.

The DOS system and its startup files must be installed in a primary partition on the first hard drive, which will be the C: drive when DOS is selected. OS/2 may be installed on any partition, primary or logical, on any hard drive. It is useful to select a different drive, or a logical partition on the first drive, so that the DOS partition can remain

Highlights of PC DOS 7

The most welcome change is the general trimming of commands and base device drivers, and the resulting increase in available DOS and upper memory. This can save 20 KB or more over the previous release, with further savings if you use disk compression, without resorting to third party memory managers.

PC-DOS 7 has moved into the online hypertext world with its documentation viewer and help facilities for the command references and error message manuals. Enhancements have been made to the IBM Antivirus support, the Central Point Backup utility, the Advanced Power Management driver (POWER.EXE) and PCMCIA setup and configuration. There is support for hot-plugging and disk compression is enhanced with Stacker 4, which also introduces DPMS into PC-DOS.

There is a new FILEUP program which manages updating when you need to maintain duplicate files in two locations. Synchronisation can be achieved through a LAN connection, or INTERLNK or by diskette. INTERSVR and INTERLNK themselves cannot be run in an OS/2 MVDM (multiple virtual DOS machine) session, since it does not support block device drivers. However, the programs will run in a PC-DOS 7 session started from diskette or image. So you can connect to another DOS machine (or to a PC-DOS 7 session in another OS/2 machine). Incidentally, if you are using a serial cable to connect the machines, you need to protect the chosen port from access by other applications on the OS/2 machine. You should change the settings for the DOS session, setting **COM_DIRECT_ACCESS** and **COM_HOLD** to ON.

A number of new commands have been added to PC-DOS 7. These include ACALC (mathematics support), DPMS and DOSDATA (memory management) and Stacker which replaces Superstor/DS. These supposedly offer greater than 2x compression, the use of extended memory via DPMS and support for windows 3.11 32-bit file access. It can handle compressed drives up to 2 GB in size. The version of Stacker included is Stacker 4 for DOS and Windows only. This means that you must stay with the Stacker for OS/2 and DOS, if you want to use OS/2 as well as PC-DOS. Stac is working on a new version that should resolve this limitation.

DYNALOAD is a new command which allows you to load a device driver dynamically from the DOS command prompt or a batch file. You specify **Dynaload device_driver [parm1 parm2 ...]**. To load the device driver into high memory, you must prefix the command with **Loadhigh** or **lh**. DYNALOAD can be used to change the current system device configuration without requiring you to modify the CONFIG.SYS file and restart the system. It cannot be run in a Windows DOS session, or when task swapping is active, or when DESQview is active.

There are several DOS device drivers which are specifically supported. You may find that other drivers, such as the CDROM driver, will load this way, even though not officially supported. If you are developing or updating device drivers, this is a useful option to bear in mind. In particular, you should consider the implications for removing devices and device drivers, without the need for a restart, and include an **Unload** or **Remove** program or parameter.

Additionally IBM has also enhanced some of the existing PC-DOS commands and dropped others altogether. For example, wild card and sub directory support has been added to **FIND**. Also, the original DOS **BACKUP** command has been re-instated. But, some of the older commands such as **EDLIN** and **COMP** did not make it to PC-DOS 7, though DOSShell continues to find favour.

As PC-DOS includes complete versions of the add-on utilities, there are many files in the installation set. To hold down the number of diskettes needed, files are bundled in groups and compressed. The diskettes (other than the initial setup diskette) are specially formatted using the eXtended Diskette Format (XDF) to increase their capacity from 1.44MB to 1.84MB. The normal user does not need to be aware of this, but you may find it interesting to understand the process used. The physical sector size is changed to 1 KB and extra sectors are squeezed onto the outer tracks.

The XDF driver makes the diskette appear as though it has a sector size of 512 bytes, and 23 sectors per track, so DOS can access it. Without the XDF loaded, you will see only a descriptive **README.XDF** file. The **FILES.txt** on the first diskette shows the bundle file and which diskette holds each file. You can use **UNPACK2.EXE** to extract individual files or you can let Setup handle it all transparently.

General

DPMS_DEREGISTER	0	Deregister from DPMS server
-----------------	---	-----------------------------

Control transfer to/from protected mode

DPMS_CALL_PROT	0100h	Call protected mode procedure
DPMS_CALL_REAL_RETF	0101h	Call real mode procedure (RETF)
DPMS_CALL_REAL_IRET	0102h	Call real mode procedure (IRET)
DPMS_CALL_REAL_INT	0103h	Call real mode interrupt (Full)
DPMS_REG_DEF_PROT	0104h	Reg default protected mode procedure
DPMS_REG_DEF_REAL_RETF_16 equ	0105h	Reg default procedure 16-bit RETF
DPMS_REG_DEF_REAL_IRET_16 equ	0106h	Reg default procedure 16-bit IRET
DPMS_REG_DEF_REAL_INT_16 equ	0107h	Reg default interrupt handler 16-bit
DPMS_REG_DEF_REAL_RETF_32 equ	0108h	Reg default procedure 32-bit RETF
DPMS_REG_DEF_REAL_IRET_32 equ	0109h	Reg default procedure 32-bit IRET
DPMS_REG_DEF_REAL_INT_32 equ	010Ah	Reg default interrupt handler 32-bit

Descriptor management functions

DPMS_D_ALLOC	0200h	Allocate descriptor(s)
DPMS_D_FREE	0201h	Free descriptor
DPMS_D_ALIAS	0202h	Create alias descriptor
DPMS_D_ALIAS_REAL	0203h	Build alias to real mode segment
DPMS_D_SET_BASE	0204h	Set descriptor base
DPMS_D_SET_LIMIT	0205h	Set descriptor limit
DPMS_D_SET_TYPE	0206h	Set descriptor type/attribute
DPMS_D_GET_BASE	0207h	Get descriptor base

Linear memory functions

DPMS_M_FREE_SIZE	0300h	Get size of largest free block
DPMS_M_ALLOC	0301h	Allocate extended memory
DPMS_M_FREE	0302h	Free extended memory
DPMS_M_MAP	0303h	Map as linear memory
DPMS_M_UNMAP	0304h	Unmap linear memory
DPMS_M_GET_PAGE_TABLE	0305h	Get page table entries
DPMS_M_SET_PAGE_TABLE	0306h	Set page table entries
DPMS_M_MAP_SIZE	0307h	Get largest mappable block size

Miscellaneous functions

DPMS_M_RELOC	0400h	Relocate segment to extended memory
--------------	-------	-------------------------------------

Figure 5 - The DPMS function numbers

accessible even when OS/2 is in operation. The OS/2 partition will also be accessible from DOS - unless you choose to use the HPFS file system, which is not accessible with standard DOS.

You can run DOS 7 even when OS/2 is in operation, by preparing a start diskette and selecting the 'DOS from Drive A:' icon. Take an ordinary DOS 7 bootable diskette, but use HIMEM.SYS and EMM386.SYS from the \OS2\MDOS directory in your CONFIG.SYS, and add the `Fsfilter.sys` device driver to give access to the OS/2 file system. You should use the OS/2 versions of other device drivers, except for devices that will be identified only to the DOS system.

If you will frequently need to run PC-DOS 7 under OS/2, you can create an image on your hard disk from the diskette you create as above. When you start PC-DOS 7 the DOS image will appear as A:, so you will need to specify an alternative drive letter if you want to access diskettes in PC DOS.

Summary

We have looked at just some of the features of the new DOS. We've hardly mentioned Windows, because PC-DOS 7 continues to support Windows 3.1 and 3.11 as before. And we have skipped some of the more esoteric features such as PCMCIA and docking bay support. However, there are clearly some interesting features in the new DOS and, if it is going to be the main support for non-Windows 95 PCs, it may be the only version to look at for DOS and Windows development.

Michael has worked in the mainframe environment for many years, in technical and development roles, and switched in the early eighties to the architecture and design of systems based on PCs and local area networks. Currently, Michael is a systems design consultant specialising in distributed and networked solutions.

E is for Edit

The PC-DOS 7 E editor has mouse support and drop down menus. There is a browse mode, which allows you to examine a file without the danger of accidentally changing it.

But the most useful feature is its ability to handle multiple file edits - up to 38 files in fact. It has a windowing facility, so that you can view up to four files at once. These windows can be tiled, or can be overlaid. Although the editor uses internal macro commands, it is not shipped with a macro building capability.

However, the Alt+Equals key combination will execute the current line or a marked set of lines, as if entered on the editor command line. Any of the E editor commands can be executed in this way.

The marked lines could be in a different file in the edit ring but the commands will be applied to the current active file. This makes it possible to save a set of commands in a text file, and invoke them whenever they are needed.

The E editor can also capture and play back keystrokes. The immediate macro that is generated is available throughout the ring. It will be remembered by the editor until a new keystroke is recorded or the edit session is ended.

You can specify a number of files to edit at one time using separate file names and wild cards. Files can then be loaded when E is started, or added later during an edit session. The multifile capability, plus the syntax assistance offered for C and REXX files, makes this a useful editor for development.

There are short cut switches available when you invoke E, clearly added by the IBM developers to edit frequently needed files. Just typing E/C/A/I will edit CONFIG.SYS, AUTOEXEC.BAT and STACKER.INI all at once.

The DOS 7 Setup program uses the editor to present its revisions to the startup files, along with an explanation, at the end of the installation. This could be a useful trick to adopt for your own application installations.

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Glimmer of hope for Apple developers

For the last two years the development programme has been in shambles. With the appointment of a new Developer Relations manager, has Apple finally got its act together? **Paul Smith** decided to ask him...



Last year, in a number of my columns for EXE, I heavily criticised Apple's attitude towards developers. Its developer services had effectively been suspended. It looked as if Apple had completely forgotten how important the development community is to its success. Well, during the last few months the situation has altered: Apple is showing signs that it may be improving its attitude to developers. This month I have been speaking to Leigh Darby, the newly appointed Developer Relations Manager at Apple Computer UK Ltd, in which he explains how things have changed.

Life before Apple

Leigh Darby joined Apple in 1989. Previously, he was at a UK minicomputer company for 5 years which sold large systems to local government, health and various other large organisations. Not exactly a logical background for software development. But Leigh believes his previous life has given him a far greater understanding of the actual process.

On his relationship with developers he comments. 'I've been involved in the industry from two very different perspectives which helps a lot in dealing with all sorts of developers working on everything from games to client-server applications.'

Before taking on his current role at Apple, he managed other support functions such as training plus a spell in AppleSoft, the software side of Apple's business divisions. 'Because of my background outside and inside Apple I had no problems accepting this new role, having experienced first hand the issues concerning software development.'

Essentially, Leigh is the developers' representative at Apple. He makes sure that any situations in which developers' interests should or could be voiced are identified and made the most of. Like any multi-billion dollar company, Apple has a fairly large and complex internal structure. 'A large part of my job is being in the right discussion at the right time - in a room, on email or even at the coffee machine!'

A developers' charter

Looking at the actual 'charter' for services which Apple intends to provide to the developer community, the aim is to offer the programme members as much technical and commercial support as possible with the resources at Apple's disposal. Apple worldwide offers two levels of membership, Associates and Partners. All members receive monthly mailings containing technical and marketing newsletters and CD-ROMs. Partners also receive online code level support from the US. 'However, the UK team is here to add value over and above this service through several means,' adds Darby. Among these are special events organised by Apple.

Whenever possible, Apple will attempt to resolve specific issues a developer may have, such as testing compatibility on a new CPU. With over 300 members and growing, another service on offer is that of 'brokering'. This is where developers are put in touch with each other, and introduced to non-members to help with their development. In addition, Leigh believes it ensures that any new developers who see the opportunities triggered by their customers or their own plans have a means to adopt the Macintosh as smoothly as possible. He predicts that this will bring in new members once they see what the value of being a member can bring.

Apple, of course gets something back in return. 'At the end of the day, from Apple or any other vendor's perspective, the only true measure of success is platform sales.' Leigh realises that applications sales drive Apple's sales. So keeping existing Apple developers on that platform is the number one priority. He identifies a number of key markets and uses for Apple products. These are publishing, learning and mobile communications for the business and the individual. 'Bringing relevant developers and Apple people closer together is a key responsibility for me.' So, if a great new UK product for PowerBooks (notebook CPUs) comes along, Leigh would be involved with the relevant product and solution marketing people.

Apple has learned for good that the 'hearts and minds' of developers are where platform sales are ultimately derived

The bad old days

Leading up to the change 18 months ago in which developer services were effectively closed down, Apple undertook a radical change in its business model. It moved from a relatively low volume/high margin vendor to completely the reverse (Apple currently sells more CPUs than Compaq in the US). Low margins meant cutting costs across the board. Darby regrets that developer services in this period were reduced to monthly mailings and email support from the US. There was no local capability, but it didn't completely go away. 'I don't think this was a change of heart, simply an indicator that Apple was facing tough competition.' Anything that wasn't directly related to sales or marketing had to be scaled back until things improved. The relative success of the PowerPC (well on track for 1 million in the first year) has freed up some resources. Developers are amongst the first to receive the benefits.

To an outsider it sometimes seems as if staff at Apple UK view developers as a bunch of parasites who are only out to get some free kit. Which is missing the point somewhat. Darby believes that internally, Apple has a 'new' attitude towards developers.

He reckons the recent introduction of the PowerPC has also taught many people at many levels inside Apple that developers are important. 'Users *buy* hardware to run software, rather than the other way around.' It is more a case of being 'reminded' rather than 'taught'. Leigh retorts: '...rather like asking people if regular exercise is good for you.' Obviously it is, although many people don't do it as much as they should. 'That's why we need constant reminders to keep exercising.'

But this whole new attitude to the developer community is not concentrated in Darby's department. 'I take it as a positive sign that I can always get the attention of a sales or marketing manager at Apple: getting onto the agenda of their meetings to discuss issues or ideas is not a problem.'

The US-sourced mailings and support have been consistent over many years. The additional UK service should improve with time. 'Apple has learned for good that the 'hearts and minds' of developers are where platform sales are ultimately derived.'

Windows defectors

So to the big marketing push for Windows 95. The hugeness of the Windows market is a constant pull for every developer. Apple has consistently lost out in the marketing arena in previous years. But for Apple, moving to the PowerPC architecture was a first in the industry. The first to take almost an

OpenDoc beta ships

At the time I was writing this article, Apple was polishing up the SOM-based beta release of OpenDoc for Macintosh, ready for release to developers. Wide distribution of pre-beta OpenDoc was due to take place during December of 1994, including a CD that was to be bound into MacTech magazine (a US magazine for Macintosh programmers). The beta itself is due to ship during January 1995 and will be widely available to developers.

I first had the opportunity to work with the pre-beta SOM OpenDoc at an Apple developer event that was held in Stockholm early in November. This event was a two day conference followed by a three day 'kitchen' for an in-depth teach-in about OpenDoc. Conflicting commitments meant that I was unable to stay for the kitchen. Back home, in spite of a lack of documentation (I was working on my own, with alpha-release documentation) I was able to get a new OpenDoc Part Editor up and running in a couple of days.

OpenDoc part development seems to be fairly easy, but it's a paradigm shift and as such requires some careful thinking. OpenDoc is not an applications development framework in the sense of something like MacApp or PowerPlant: it is an API that permits the easy development of OpenDoc Part Editors. A framework christened the OpenDoc Parts Framework (OPF) will ship some time in 1995. But for the time being you need to use a tool called 'PartMaker' to create the source code shell of your part and then fill this in by hand. This is how I created my first OpenDoc parts. But I think that for future work I will start by creating a very simple framework on top of the PartMaker-emitted shell, to make my life easier.

The pre-beta release of OpenDoc that was distributed during December was the first SOM-based OpenDoc to be made available to developers. The beta runs on both the Power Macintosh and 68K Macintosh platforms. It is feature-complete with 'final' APIs. All 'partner' and 'associate' members of Apple's developer programmes will automatically receive a copy of the OpenDoc beta CD. If you are not a programme member, send electronic mail to opendoc@applelink.apple.com to find out how to get your copy.

The word on the street is that the Windows version of OpenDoc, being developed by the Word Perfect division of Novell, is running a few weeks behind the Macintosh version. So Windows developers should expect to be able to get hold of a beta around the end of February 1995.

entire installed base of software, yet offering the opportunity to migrate to new levels of performance and functionality over time. Similarly, Darby predicts the same is true of other Apple technologies. 'OpenDoc offers an evolutionary means to break out of the monolithic application model on all current major platforms.' He is adamant that developers will need to take note of such technology. Developers on other platforms may currently be unimpressed but over the next couple of years it will become increasingly clear that early 80's hardware and software architectures cannot be sustained indefinitely. Leigh predicts that developers who seriously evaluate 'safety in numbers' versus 'take the lead' approaches to future developments will identify the benefits. For example, implementing OpenDoc is probably the easiest way to implement OLE on Windows 95.

On the profitability side, although Apple is commonly viewed as a minority market, it's a pretty big one with well on the way to 15 million seats worldwide, and still growing very healthily. Amazingly, Leigh has spoken to a number of UK developers worried about the state of affairs in the Win-

dows market. 'I've recently had several calls from DOS/Windows developers who face hard competition driving down prices and margins or are experiencing high development costs, testing and supporting many system software/hardware configurations.' For Darby the Macintosh (and OpenDoc) market is a means to redress these points.

Where to go

To receive a free information pack on the developer programme at Apple, telephone 0800 505094. If you wish to discuss specific developer issues or opportunities, you can request to be put in contact directly with the people who look after the programme at Apple. Anyone with Internet access can also email: UK.DEVSERV@applelink.apple.com. ■

Paul G Smith provides technical and team-management services and training through the Commstalk consultancy, and was lead developer of Macintosh software products including Commstalk-HC and ScriptWizard. He can be reached by electronic mail at paul@ctalk.exnet.com, and by telephone at (0727) 844232.

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In a village, beside a stream, there lived a carpenter called Fred. And a very good carpenter he was. He would cut down the trees from his small wood and from them make tables. Fred liked tables and knew a lot about tables. The tables he made were the very best. Close by lived his friend Bill who was also a carpenter but he made chairs. Bill was good at chairs and the chairs he made were the very best.

Whenever someone in the village wanted tables and chairs they would go to Fred and Bill. The tables and chairs went together perfectly. They looked right. They were the right size. And of course, they were all of the very best quality.

One day, Bill came to Fred with an idea. 'I want you to go on making tables just the way you've always done it. But I'm going to make the chairs slightly wider.'

Fred was shocked. 'If you do that, they won't fit my tables properly. What's the good in that?'

'Trust me,' said Bill. And because he was his oldest friend, Fred did.

It didn't take long before the villagers noticed that something was not quite right. The chairs worked as chairs were supposed to do. They were just as comfortable, and of course, they were of the very best quality. But though nobody could explain why, the tables and chairs were somehow unsatisfying. The villagers started to grumble amongst themselves, saying that the furniture wasn't as good as it used to be, that there had been *proper* furniture in the old days.

Fred heard the grumbles and decided to complain to Bill about it.

'Aha', said Bill, 'They're right, aren't they? I guess we need to solve their problem. What we need to do, see, is make bigger tables.'

But Fred wasn't happy; 'We wouldn't have needed to make bigger tables if you hadn't made bigger chairs'.

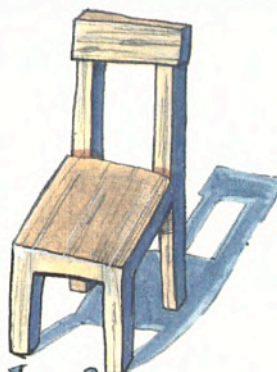
'Exactly, but now we do need to make big-



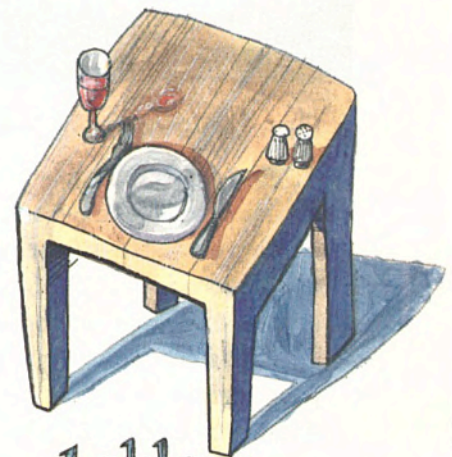
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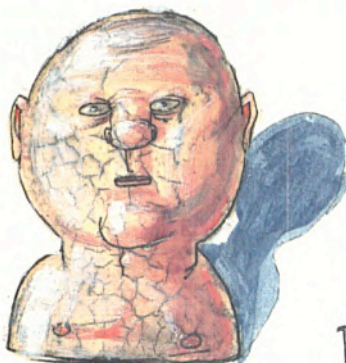
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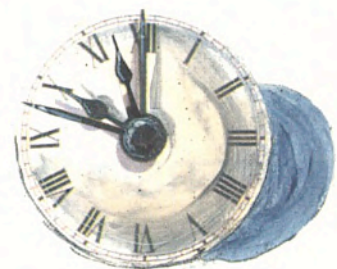
table



human



human
brain



clock

ger tables. And what's more, they need to buy them.'

Fred finally understood. 'So, instead of buying one table, now they have to buy two! How much wider did you make your chairs?'

Bill smiled and said, 'I made the chairs one inch wider, but I want you to make your tables a little higher as well.'

Fred made his tables. He announced to the villagers that he'd made a better table than before. When people bought his new tables, they had to agree that they were better than the old ones. There was still something a bit unsatisfying about them, but they certainly offered more elbow room. Soon everybody was buying the new improved tables. Nobody had a use for two tables. So they took the old tables, the tables of the very best quality, the tables with nothing wrong with them, and chopped them up for firewood.

Fred, of course, was making lots of tables and doing excellent business. He knew that the new tables were just as good as the old ones so he was happy. But he thought of his friend, and realised that he was selling no more chairs.

'Bill,' he said, 'I'm doing all this extra business, and you're getting nothing out of it. That's not fair, after all, it was your idea.'

But Bill just smiled again. 'Oh, I'm going

to get something out of it. Tomorrow I'm going to make taller chairs, to fit your new tables better. Only thing is, I'm going to put footrests on them, so they won't quite fit underneath any more.'

And that's what he did. The new, improved chairs were on sale the very next day. They were taller, so now the villagers could lean their elbows on the table. But because of the footrests they had to lean forwards to do it. Everybody agreed, the new chairs were a huge improvement on the old ones. And if you had to lean forwards once in a while, well, that's the price of progress. Everybody bought the new chairs.

But now they had far too many chairs. So they took the old chairs, the chairs of the very best quality, the chairs with nothing wrong with them, and chopped them up for firewood.

Once everybody had the new chairs Fred discovered that he could solve the problem of having to lean forwards by making a bigger table top. Bill fitted all his chairs with wheels so they were easier to put under the table. Fred then made tables with ropes, so the chairs didn't roll away when the villagers were eating. Bill upholstered his chairs. So Fred inlaid the table tops to match the upholstery. Every time a new model was announced, everybody agreed how much of an improvement the new design was and chopped up their old furniture for firewood. As the tables and chairs got bigger people needed to buy bigger houses to put them in, or stepladders to climb up. But nobody really complained. After all, look at all the benefits the progress so far had provided. A little inconvenience was only to be expected.

As for Bill and Fred, they were doing wonderful trade. They were working so hard to make all the tables and chairs needed, that they were barely able to fill their orders. People, not wanting to be left behind in the race, were ordering their next table or their next set of chairs as they were picking up the previous order. Half the people in the village were working for Bill or Fred, making tables and chairs to satisfy the skyrocketing demand. Lamps were burning though the night. Villagers were barely able to sleep for the noise of sawing, hammering and the shouts of the workers. Nobody really minded, because with all this work, everybody was being paid handsomely.

The woods belonging to both Bill and Fred had been emptied of trees long ago. The land was turned into another factory. To provide the raw materials, they bought every wood for miles around. They even

Bill fitted all his chairs with wheels so they were easier to fit under the tables.

Fred then made tables with ropes, so the chairs didn't roll away.

had workers, pockets bulging with money, looking for new forests to buy.

Then, one day, Fred went to his factory, to see how his design team was doing with the Super-Table Mark 3 (Outline) and found the entire factory silent. Not a nail was being hammered, not a plank was being sawn. Bill was sitting in the floor with his head in his hands.

'No more wood,' explained the foreman. Rather pointlessly, he added, 'You can't make tables without wood.'

Fred sank into the nearest chair, which collapsed, smashed to splinters.

'We were putting in so many features' explained the chief designer, 'that, in order to get the price down to an acceptable level, we've had to make some, er, manufacturing compromises.'

'Well, then,' said Fred, 'We'll just have to go back to doing it the old way. Simple tables, simple chairs, one model fits all. And, we'll make them by hand again.'

Bill looked up. 'Too late for that,' he said. 'No more wood, it's all been burned. Besides, now we're going to have to lay off all these people. Who could afford to buy our furniture even if we could make it?'

They laid off all their workers, closed and locked their factory. And because the starving and freezing villagers now hated them so much, eventually packed two small bags and walked off down the river together.

As night was falling, they sat down on two rocks and watched the river flow on its course. Fred was utterly dejected. But Bill refused to give up. He looked down at the rock he was sitting on and inspiration suddenly came. He grinned.

'Fred,' he said, 'I think I've had an idea!'



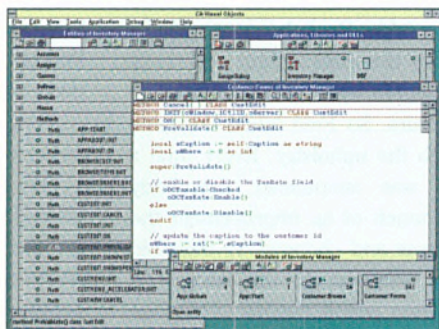
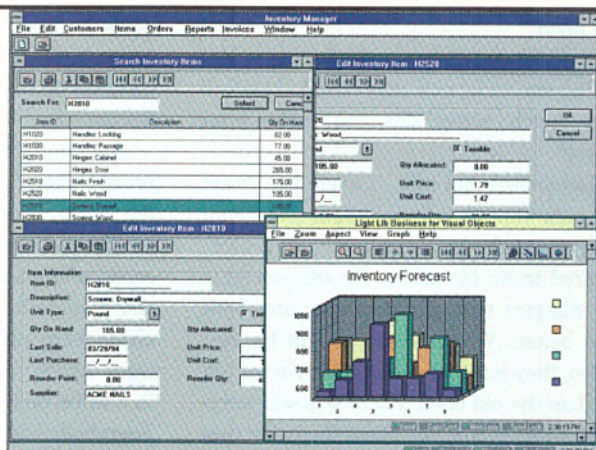
Earth

Jules' computer sits on a wooden table next to a wooden telephone. You can try getting through to him on 01707 644185. Or email him as Jules@cix.compulink.co.uk.

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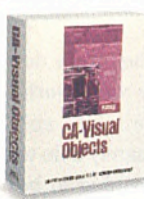
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Developer's Notes

Notes is recognised as the leading workgroup platform. **David Mery** investigates whether, as Lotus claims, it is also a good development environment.



Is Notes for everyone? Probably not. Most developments for Notes have been done internally at companies that had already installed Notes, or at least had taken the decision to. Notes as a workgroup environment is not meant to be used for just one application in an organisation. You should look at it as a development solution only if it's already there or if your application has a definite workgroup edge.

With previous versions, databases were either developed internally or given to external specialised consultants. Often these consultants were contracted to complete the installation of Notes in at least one site and then deliver bespoke applications. Lotus probably realised that the Notes market would be much larger if more people could develop for it. So it released ViP, a visual Basic-like language. It's a current trend. Novell launched Visual AppBuilder, its WordPerfect division is working on OpenDoc, Lotus with ViP...

But all that excitement has not stopped the production from the traditional software tools companies. Since Notes has now imposed itself as the leader in the workgroup platform, they're all queuing up with add-ons to ensure that their product works with Notes. The only direct attack to Notes is coming from Microsoft with *Exchange Server*, which has still to prove itself. However, it looks likely to be a more serious competitor

than Windows for Workgroups, which was presented by Bill Gates at its introduction, as a Notes competitor.

What is it?

Notes is a workgroup computing environment. It scales easily between a LAN and a WAN so the geographical location of information is not very important, if relevant at all. It can be used for many workgroup applications and is especially well adapted to distribute information, route forms and email, or for interactive applications.

A Note installation consists of at least a Notes server and a Notes workstation; both are simply nodes on the network. The server provides service to workstations and to other Notes servers. It can be installed on OS/2, Unix, NetWare and Windows NT. Notes servers are not file servers and are distinct from file servers present on a network. Clients are available for Windows 3.1, OS/2, Macintosh and Unix.

Data on tap

All information in Notes is stored in databases. These hold documents with diverse structures. There are forms for creating and reading the documents, views for selecting and sorting them, macros for processing them and security rights. Since most databases can be shared, security is completely integrated.

When opened the Notes client presents a notebook-like interface in which databases can be added to each page. In fact, the database isn't added per se, but instead is represented as an icon which is added to the workspace. The database itself remains physically on the Notes server.

A database can be local on a workstation. Either for personal information such as diaries or when designing a new service. But most of the databases are shared amongst users on a LAN or across a complete company.

When databases reside on more than one server, Notes implements a replication process which allows transparent distribution of information between different servers or with a laptop. The synchronisation between databases located on different machines is always done by replication. Each time two servers communicate (through networks, bridges/routers, serial link,

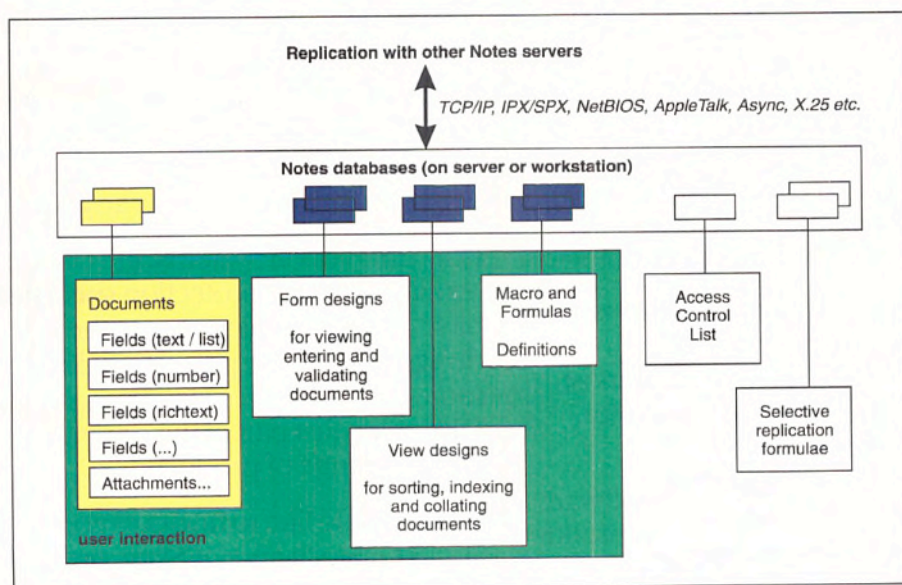


Figure 1 - Notes architecture



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dialup link, etc) all the differences between replicated databases are exchanged.

There is one special type of database called the *mail database*. It is also usually located on a server but only one person can access it. This database is usually replicated when the user works on a laptop offline. It is then replicated each time the user dials in his or her main server.

Documents, forms and views

Notes databases are composed of *documents* which can be viewed from *forms*. In turn, documents are made up of *fields*. In addition to basic text fields, Lotus also supports rich text, numbers, date/time, tables, graphics numerical data and embedded OLE objects. With the right hardware, sound and video are also available. Furthermore, DDE links can be used on Windows and OS/2.

Each database has a set of special users called *designers* that create forms to control how data is entered and validated and how the information will be displayed. They also create *views* that correspond with the table of content of a book. Users can add their own private views to any database they have access to. A database can have as many views as necessary, each organising the information differently. Since version 3, Notes also include a powerful full text search engine licensed from Verity.

It is possible to build hierarchical views of documents with rich-text fields. In other words a database could contain a main document comprising of questions. Each response would be a separate document, 'linked' to the relevant question(s). Most da-

tabases contain a main view which presents the hierarchic list of documents as an outline. This outline can be sorted and categorised, although it doesn't have to list every document of the database. It is especially useful in a mail folder. For instance a mail database can have views categorising and sorting mail messages according to their date, author and topic.

Clone factor

When documents are added to a database any user of the same instance of the database has immediate access to them. Users of other replicas will see new information after the next replication happens. Replication occurs regularly on a schedule specified by the database manager and Notes server administrator. The periodicity depends on the type of links between the Notes server. Usually this ranges between once an hour and once a day.

During replication new documents as well as updates are automatically received. The end result is that the two Notes servers both contain the latest information available. Since forms and views are held in the database with the actual data, the design of an application is also replicated. So deploying a Notes application on several sites is very straightforward. All that is needed is to have the database checked to be replicated and a replication scheduled.

Protect from replication

The information contained in Notes databases can be replicated very easily on many sites in an organisation. Therefore security features are completely integrated into

Notes. All sites may not be as secure or accessed by the same type of people, so it's important that only persons for whom a database has been created have access to it. Security is controlled by Notes administrators and database managers. These people define who get access to which database and how they can use it. To create a new account, the Notes administrator uses the private key of the server to make a certificate which is stored with the user id. The certificate validates the association between a single name and a single public key. To connect to a Notes server, the user certificate has to be accepted (*authenticated*) by the server.

The server grants or denies access to a specific id on the basis of its certificate. Since certificates are generated with the private key of a server, users can have several certificates, one for each server to which they connect. The certificate is required during the connection process, so it's also used when a replication occurs. A certificate is also used when signed mail is received. At the recipient's workstation, Notes checks that the sender's information matches the accompanying certificate.

At the database there is a further level of security. The Access Control List (ACL) details who can open the database and what they can do to its information. ACLs are replicated with the database, so requests to have access to a database have to be mailed to the database manager even if he/she is located at another site.

For development

Applications can be developed directly in Notes. It's well adapted to create compound documents with multiple entry forms and control the workflow of a document. The structure can be simple, as in a discussion database, or very complex as in a problem-tracking workflow application. When creating an application, the designer defines the various components of a Notes database such as forms, fields and views. There will also be an icon which will represent the database on the desktop, an 'about' document which will be shown the first time the database is opened and an ACL.

Lotus also includes a macro language with several built-in functions for building Notes applications. You can write formulas to calculate a value for a field, to select documents for display in a view, etc. Functions are always prefixed by @. There are about 100 functions. As expected the main ones include string recognition and manipulation, calculations using numeric values and time-date generation and manipulation. Lotus provides other, specialised functions for logical operations, statistics and hierar-

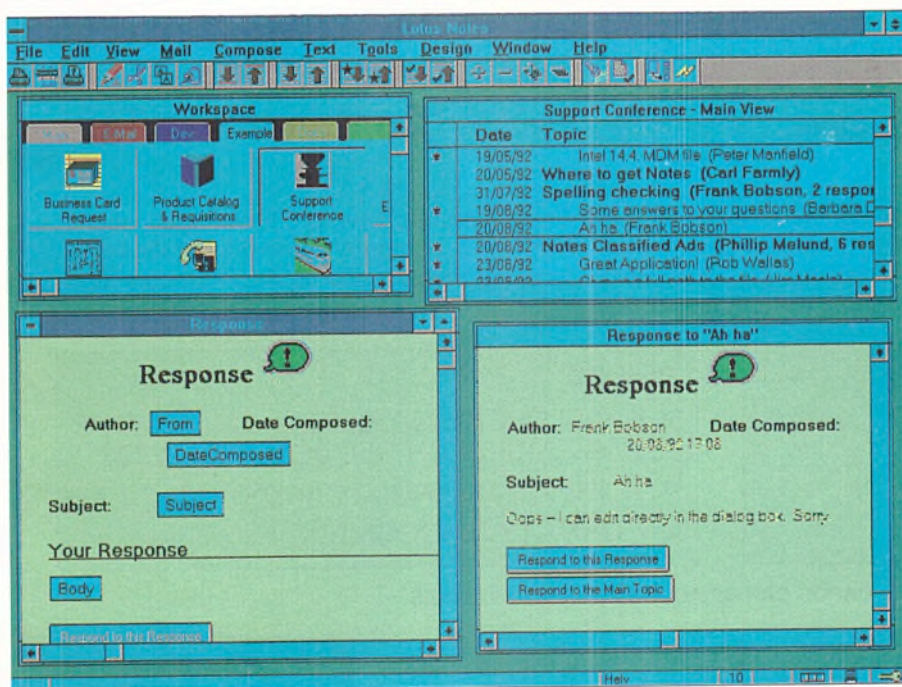
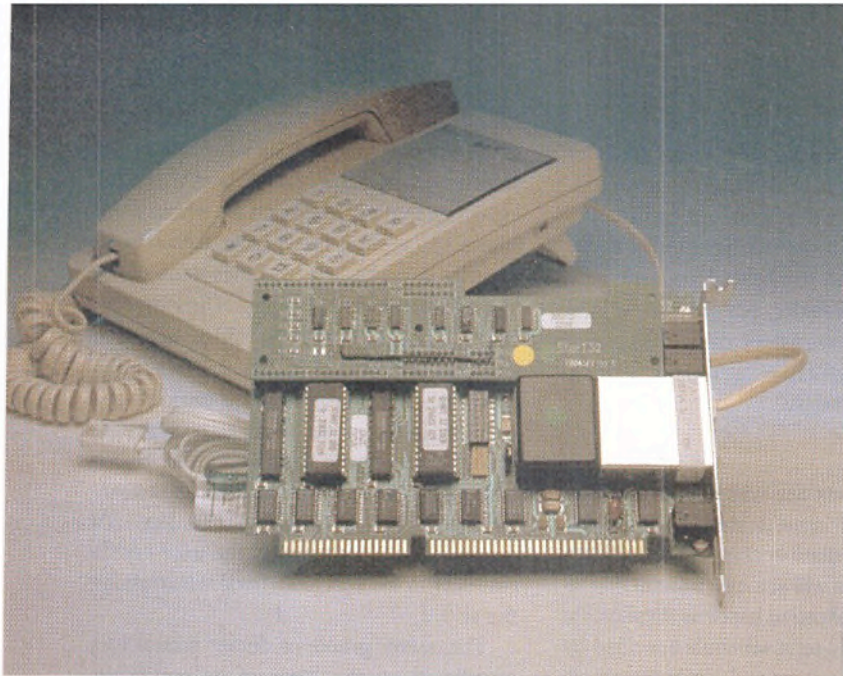


Figure 2 - A Notes application, a view, a form and the design of it



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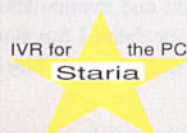
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chy views, database and document information and calculations from lists. There are also functions to retrieve values from other data sources and some miscellaneous ones.

Macros are formulae that perform some type of action, such as sending mail. They are defined through several different interfaces. The filter macro is the main type. It evaluates documents according to a specified criterion, determines which ones to process, then take action. Background and mail/paste are special filter macros that execute automatically in the background. The execute-once macro operates on all the selected documents of the current view. Search macros works only on full text indexed databases and search for documents matching an associated query. There are also macros to be associated with icons (SmartIcons), buttons and pop-ups. Macros are stored with the database and so replicated with it.

Three ways to create

For any type of development, the creation stage is usually done locally on a workstation. Then when the design is finished, the database is put on a Notes server and access is given to a small group of beta testers. Last stage of the process is to give access to all the potential users.

There are three approaches to application development that can be adopted in Notes. Create a blank database from scratch, base the new design on a Notes template or copy and modify an existing database. The only difference between the last two methods is that when copying an existing database, the resulting database will probably already contain documents. The most common way is to start with a template and build upon it. Even when starting from scratch, it is possible to copy views or

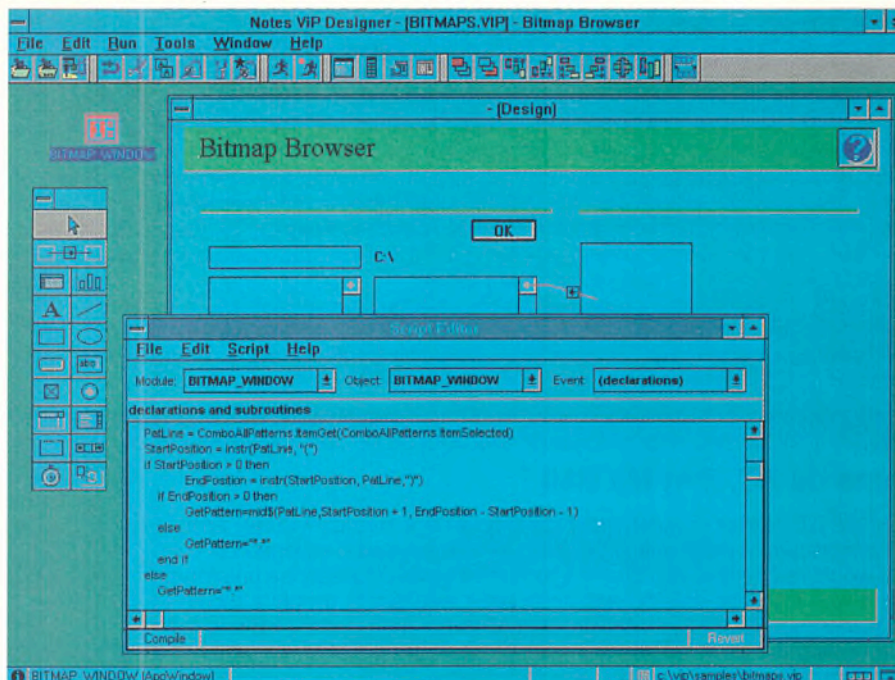


Figure 3 - ViP design and script editors

forms from existing databases.

If a database is based on a design template, it will be automatically updated to reflect the changes every time the template is modified. Of course, the update mechanism can be controlled. The whole design, or maybe just a few of its elements such as forms or views, can be inherited. It's also possible to make a one-time copy.

Front ends

For developers who need access to more processing or need to use documents in non Notes client programs, there are a number of external interfaces. The most basic is via the C API, listed in the online documentation. This provides the interface with data types, functions and symbolic values.

However, Lotus has a better approach. It has developed a new tool: ViP (Lotus Notes Visual Programmer). This is a visual programming tool for Notes implements the LotusScript Basic compatible language. It also uses Powerful Visual, a 'draw and program' tool where Lotus components can be linked together graphically. ViP also supports many legacy database formats. But many third parties also cater for Notes developers' needs. Products include PowerBuilder for Notes, Forest & Trees from Trinzic, Gupta SQL/Windows for Lotus Notes and Visual Basic extensions from Edge Research and Brainstorm Technologies.

Powersoft has a technical and marketing relationship with Lotus for its CODE program. PowerBuilder Enterprise version 4 now includes PowerBuilder for Notes which provides 'seamless' integration between the two products (it's also available as an option for the other packages). At the last user group meeting in October, Powersoft ran a session on Power Builder for Notes.

When to take Notes

Notes is very good at distributing information and providing a consistent interface that can scale from a small network to a global WAN. So when an application is concerned mainly with presenting existing information already contained in a database, Notes is fine. For complex calculations, however, it is probably better to use a C compiler or a third party tool and then interface to Notes for the presentation part.

Lotus is on 01784 455 445

Notes and C++

Triangle QA developed a Notes application for management of the quality process to help companies achieve ISO 9000. The software was developed with both Notes and under JBA's Guidelines, a C++ generator. The application runs on an OS/2 workstation. There are currently more than 500 users. At the start of each day all databases connected with the legacy systems are started. Notes then provides a consistent interface for all the information. Jim Chapman, Triangle QA MD, considers Notes 'an extremely good environment to develop simple rules.' His team has chosen to develop all interfaces directly with Notes. But user actions mainly trigger event handling code written in OS/2 C++ which processes the database information. C++ modules are called from Notes with data structures passed between the two.

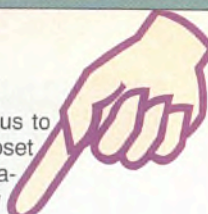
Jim Chapman adds 'Notes is a good business OS [which provides] an integrated look and feel.' In the application, it shields the user from the complexity of Client/Server dialogues, connections... Using both C++ and Notes gives the 'benefit of both the power of transactional and an integrated interface.' With this application, Jim Chapman comments 'We're not vomiting vast amounts of information to the users, it's a slim elegant system.'

On developing completely within Notes or with ViP, Jim Chapman is tougher: 'Notes fails if you use it as an application development tool, it's poor at that [...] With ViP, Lotus is trying to make you think that you can do anything with Notes.'

I have seen the future...

Another COMDEX passed us sadly by. And still nobody would pay for us to jet out to the US and experience it first hand. Ctrl Break was especially upset to hear that it missed out on the chance to hear Bill Gates' speech 'Information At Your Fingertips'. Apparently Mr Gates 'unveiled' his vision of how technology is going to enhance and advance our future lives. Technology in this context no doubt implies that of Microsoft. Gates painted a heartwarming picture of the many benefits we could reap from this situation, including ambulances linked up to the hospital X-ray department for that extra quick diagnosis. Maybe in America, Mr Gates. By the time this technology will be feasible Britain's declining NHS will be hard-pushed to provide anything more high-tech than two cans on a string.

Although maybe that isn't such a bad thing. Waiting for version 3.1.11 of 'Heart Monitor' to come out could be slightly more stressful. Or how about the lethally high blood pressure reading. 'Oh, that's just a bug in the Pentium.' Sorry. I think we're supposed to run that one next...



Ctrl

Come on BT, ring Ma Bell

Did the BT 'hacker scandal' really come as such a surprise? Surely anyone with a modicum of programming/hacking knowledge and a smidgeon of cynicism would realise that this kind of information could inevitably be unearthed. That it was found so quickly, and apparently so easily is simply a tribute to our country's crippling fondness for bureaucracy. As a nation, we just can't resist writing things on as many pieces of paper as possible, so why not a few computers as well?

Although the fact that the database was designed by Cincinnati Bell (America's former phone monopoly) could possibly explain a thing or two. Apparently US 'phreaks' (telephone hackers) have been trawling Ma Bell's garbage for years. Thereby coming up with some pretty useful passwords. A little communication between the two companies on the subject of security could possibly have made things well, at least *difficult*, for the hacker who eventually contacted Steve Fleming. It's good to talk, eh Bob?

...BUT IT MAKES A NICE PATTERN

The 1994 Honda Prize has been presented to **Benoit B. Mandelbrot**. This award was established in 1980 to promote the concept of 'Eco-Technology': the merging of ecology and technology 'to bring about harmony between human activities and the overall environments'. However Ctrl Break suggests that an *additional* prize go to the winner this year; for the promotion of T-shirt sales and posters. Rave on Benny.



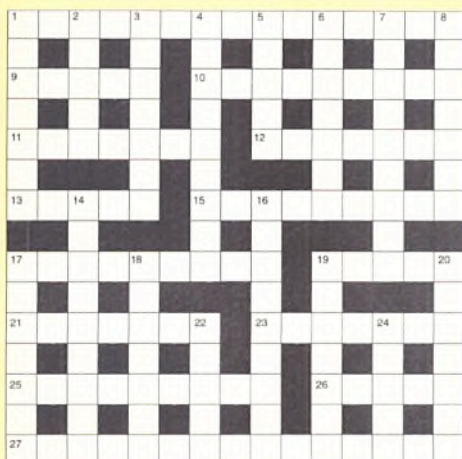
What's a decimal point between friends?

It was a professor in Virginia who finally confirmed that Intel's Pentium processor may return incorrect results on certain math calculations. And it has to be said, this doesn't make an awful lot of difference to the man on the street. Let's face it, when Joe Smith sits down to do his tax returns he needs all the elements of surprise he can get. But I don't think I was the only person to find the prospect of scientists across the world working on the wrong calculations a tad disturbing.

Of course, Intel has now started manufacturing corrected chips. Just slightly too late for the owners of the estimated two million Pentiums *avec* bug. But never fear, the developers at MathWorks have come up with their own software amendment, designed to compensate for the floating point error. Not content with this however, these crusaders of calculation have now gone on to defend the honour of Intel. With all the sleekness of a politician, Cleve Moler of MathWorks explained that the incidence of miscalculation is actually quite low. He then went on to compare patching the software on the Pentium to 'having a good battery in a smoke detector.' Of course smoke detectors don't cost £3,000 pounds a shot. Neither do they control NASA Space Shuttle navigation systems. Moler then reassures us lucky people that it is 'far simpler and more reliable' to use the MathWorks method than to replace the chip. Well he would, wouldn't he?

If I may be so bold, Mr Moler, I think perchance it would have been far simpler and quite considerably more reliable not to have manufactured such a chip in the first place.

PRIZE CROSSWORD



ACROSS

1. You can enter without delay with this (9,6)
9. I call round for purple girl... (5)
10. ...able to load software as Stalin can maybe (3,6)
11. Rubbish! Start Basic in Apple's first home (7)
12. Someone from mid-East is real, I wonder? (7)
13. Maybe it's filthy, but I like it... (5)
15. ...singing wildly on high (9)
17. Seen, I send round, in a state of poverty (9)
19. Bill may open them and/or... (5)
21. ...find the y-variable (7)
23. Using loader to hold things together...(7)
25. ...in an awful fashion, only he is U (9)
26. Values from bottom to top may take to the hills (5)
27. Looking for 13, programmers hope to enter it (7,8)

DOWN

1. It's wrong to be sick, even in France (7)
2. Base of storage on tape or floppy (5)
3. State your 21s at the start (7)
4. Initial model for the printer? (9)
5. Unusual boredom away from rotten nuisance (5)
6. Not a distributing processor! (7)
7. Crazy type from the ends of 26 (9)
8. Capitalism's main job maybe (7)

14. Hold back parts used in parity (5,4)
16. 1 for the screen, needed to compute (7,2)
17. Found with ones or crosses... (7)
18. ...nuclear species of poet, so I change (7)
19. Such high ranking knowledge may be global (7)
20. Old group involved in searches (7)
22. Homely places for looping the loop? (5)
24. Friendly relations when a nut's cased (5)

Solutions to December's Crossword.

- ACROSS:** 1. AFIELD 4. ACCEPTOR 9. OPERAS 10. GNASHING
11. SATCHEL 13. ITERATE 14. INFORMATION
17. ENHANCEMENT 21. BUGBEAR 22. LIAISON
23. EVALUATE 24. SILICA 25. TETHERED 26. AGREED
DOWN: 1. ACOUSTIC 2. IDENTIFY 3. LEATHER
5. CONDITIONAL 6. EASTERN 7. TAIWAN 8. ROGUES
12. LEATHERETTE 15. PERSPIRE 16. STANDARD
17. EXECUTE 18. ERASING 19. OBJECT 20. AGHAST.

This month's crossword prize is **MS Space Simulator**, kindly provided by Microsoft. Please send in your entries to the address on the top of the next page. First correctly completed crossword out of the hat wins!

Break

Please send your rants,
raves and competition
entries to:

Ctrl/Break
EXE Magazine
50 Poland Street
London W1V 4AX

Fashion Victims

The image of the software developer has never been particularly chic. Programmers have been lampooned from all sides with accusations of style neglect. But after years of unjustified prejudice Ctrl Break can exclusively report that the US is fighting back. Our source reported from an *advanced programming* course in California, where *all* the students had taken to sporting radical body piercings. No doubt many will speculate that this unprecedented development in the computer world is due to the more laid-back

attitude of those sunny Californians. But as we all know, where America leads, Britain will surely follow.

Could this be the start of a programming revolution? Just picture the scene as up-and-coming developers vie to show off the latest adornment. Unfortunately Ctrl Break is not able to go into any detail regarding the precise nature of these piercings. We're squeamish. Suffice to say, however, that we shall never look at LISP programmers in the same way again.

Brian and Betty

by Neil Kerber



Headbang on the Superhighway to Hell

Devious and daring as we are, Ctrl Break has managed to acquire one of only five Heavy Metal leather jackets in existence. As you can see it is a beauty: fully lined, removable sheepskin collar. It's made with especially soft leather in that ultra-trendy 'distressed' style. All you have to do to win it is send us a coupon from either this, or a previous issue of EXE. And answer these three questions...

1. Who invented PGP?
2. The most controversial change to a future C standard is...?
3. What is the hardware spec for the machine on which you would most like to develop world class software?



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EXE

The Software Developers' Magazine

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Turn to page 25 of the magazine and you'll find the second part of EXE's C++ Compiler Report. Obviously, however, we couldn't fit everything into the article. Which is why we're making available two detailed versions. The Technical Version costs £35. The Management Version (incl. full managerial reports) costs £75. EXE subscribers get a further 10% discount.

The EXE Software Developers Challenge 1995

As was announced in last month's issue. The EXE Software Developers Challenge 1995 will be in aid of the Royal National Institute for the Blind (RNIB). Competitors will be developing a much needed application for this deserving charity. And as if that weren't reward enough, the winners will be jetted off to America for the 1995 Developers Competition. Dare you accept the challenge?



BOOK CLUB

Smileys



By David W. Sanderson- 93 pages.
International Thomson Publishing Europe

This book is a collection of the computer underground hieroglyphics called "Smileys". Originally inserted into email messages to denote "said with a cynical smile":-), smileys now run rampant throughout the electronic mail culture.

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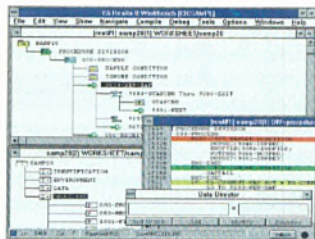


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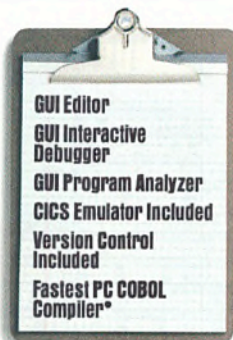
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Welcome to Perl Part II

In the second and final
part of Nial 

Mansfield's column on Perl,
he writes his first real program
and tells you where to get the
language.

In the previous issue we covered the basics of Perl. Now we're going to bring together all the various points we've seen into one biggish program. But be warned. It's only a short program, but it uses lots of Perlisms, some of which we introduce for the first time. To get the most out of it, you should really play with it on your own system and modify it to see how it works.

A real example

Our program is a simple mail-merge. It reads in a list of *records*. For each one it merges the various fields into a template letter. The record structure is very simple, with each record comprising of a number of fields. There is one field per line. One record is separated from the next one by a blank line. Each field is prefixed by a *tag* giving the name of the field and separated from the tag by a tab-character. Two sample records are shown in Figures 1. The great advantage of tagging each field is that you can invent fields at any time and they will still be processed properly. You don't have to remember which order the fields have to be in. Any order will do.

We want to process these records, merging them with a template file which will look something like Figure 2. The code is in Figure 3.

First, we open the template file `mm.tpl` or exit if it can't be opened. Then we read the **whole** template file into the array `template_lines`, as we explained last month. Since we've got everything we need, we close the template file handle.

Then we have the main loop of the program where we get each record in turn and process it. The check `eof(STDIN)` in the `get_record` subroutine is necessary because a record isn't retrieved in a single read. Records consists of several lines. If you returned 0 from the subroutine immediately after end-of-file was reached, you might have several lines already accumulated in `record` which would never be processed.

In the main loop we see the first Perlism with our use of `split`. The function `split(/pattern/, string)` divides `string` into pieces, breaking it wherever the regular expression `pattern` is matched. Then it returns the pieces as a list of values. For example,

```
@mywords = split(/[ \t]+/, $line);
```

splits the string in `$line` into individual words. These words are stored, one in each element of the array `mywords`. We define a word as all the characters between successive occurrences of one or more tabs or spaces. The character '+' in a pattern means *one or more occurrences of* whatever preceded the '+'.

The split

There are a couple of nuances relating to `split`. First, if the special variable `$*` is set to 1 then the string that is being split can include newline characters. Pattern matching will work across these *line boundaries*. We use this because the variable `$record` contains all the lines of the current record. Second, the separating strings, in this instance the whitespaces, are not normally included in the returned list. However, you can force the separators, or part of them, to be included in the list, by using parentheses in the pattern. This marks which part of the separator is to be included. We make use of this also. Consider the tiny record:

```
contact:      Fred
city:         Rome
```

We want to break it down into a list like

```
("contact" "Fred" "city" "Rome")
```

and then assign it to an associative array `$vals`. Then we can use expressions such as `$vals{"city"}` to print out the values of the various fields. So our `split` pattern for the separators starts with the beginning of line marker '^', followed by zero or more whitespaces. This is followed by any characters other than a colon (and these are the field-tag names). Then the delimiting colon, more whitespace and the field value. This breaks the record into exactly the format we want, or almost. The list returned has a null field at the beginning. If we left it like that, our returned list would be: ("",

```
"contact" "Fred" "city" "Rome").
```

That would give an associative array where "contact" was the value corresponding to the key "" and "city" the value for key "Fred". It would be all the wrong way round. To get over this, we insert an element "junk" at the beginning of the list, using the '(...)' list constructor sequence we saw earlier: ('junk', split(...)). So now the returned list is ('junk', "", "contact" "Fred" "city" "Rome"). This gives us the associative array we want (key "contact" gives value "Fred", correctly). This is what we meant earlier when we said that these scripting languages have very high-level constructs for handling their limited problem domains.

Chop it off

Continuing through the main loop we use `chop` to remove the newline from the end of **each** line in the array `vals`. The '%' is here since it's an associative array. Then, if there is no contact person named in the record, we insert a default.

Now we have to merge the values we have stored in `%vals` with the lines of the letter stored in `@template_lines`. Again we will use `split`. The idea is that if a template line looks like `rush today,` `<salutation>`, `help` `make` `<street>`. And if we split with the

```
organisation: EXE Magazine
contact:      Cliff Saran
salutation:   Cliff
work_phone:   (0171) 287 5000
fax_phone:    (0171) 437 1350
email_addr:   cliffs@dotexe.demon.co.uk
address1:     Process Communications Ltd
address2:     St Giles House
street:       50 Poland St.
city:         London
postcode:     W1V 4AX
```

```
organisation: User Interface Technologies Ltd.
contact:      Niall Mansfield
salutation:   Mr Mansfield
jobtitle:     Managing Director
idstatus:     computer-company
work_phone:   +44 1223 302 041
fax_phone:    +44 1223 302 042
email_addr:   info@uit.co.uk
street:       17-21 Sturton Street
city:         Cambridge
postcode:     CB1 2SN
vatnumber:    599 6970 47
```

Figure 1 - A sample of two records


```
<contact>
<fulladdress>
```

```
Dear <salutation>,
```

Now that winter is drawing in, isn't it time you replaced your nasty wooden windows with nice plastic ones. You may not realise it, <salutation>, but at least 4,253 other people in <city> have bought our windows, and many of them live only just round the corner from <street>. So rush today, <salutation>, help make <street>, <city> a better place, and install new Plasto-Sheen windows!

```
Yours faithfully,
```

```
Honest John's Double Glazing Company.
```

Figure 2 - The template letter

'<...>' fields as separators, we end up with an array as in Figure 4. So each odd-numbered item is plain text to be printed as is, whereas every even-numbered one is the name of a tag. The corresponding value from the record is printed in its place. The rest of the main loop does just that. It splits each template line, then prints the pieces and the record values in turn for each of those lines.

A Perl in the C

The most common mistake for C programmers using Perl is to omit the prefix character indicating whether the variable is a scalar or an array. This is especially easy to forget when the variable is a subscript, eg typing: `$total{code}` instead of `$total[$code]`

Another C-ism which will catch you out is omitting curly braces after an `if`. You will probably omit trailing semicolons if you think you are writing a shell or an `awk` script.

Subroutines, packages and the rest

We've only scratched the surface here. There's an awful lot more to Perl, not least on writing subroutines and the related issues of passing by value/reference and local/global variables. These are essential for good programming.

Then there are the facilities, such as TCP/IP sockets communication, which let you write networked or Client/Server applications. Perl also comes with several *packages*, which are collections of functions that are not built-in but supplied as libraries. These cover activities as diverse as arbitrary-sized rational arithmetic, *syslog* logging, time conversions etc. And finally there are the variants. We know of at least two, providing *curses* terminal handling. With one you can write full-screen programs. A related version includes a menu system.

How to obtain Perl

Perl is free! It has been ported to literally millions of different Unix systems, to MS-DOS and probably to lots of other platforms too. It's available on the net, in any *comp.sources.unix* archive or from anonymous FTP sites:

`ftp.uu.net`

`archive.cis.ohio-state.edu`

and lots of others. To find an FTP site near

Item	Type	Value
1	text	rush today
2	tagname	salutation
3	text	, help make
4	tagname	street
5	text	,

Figure 4 - Sample template splitted

you, use *archie*. If you don't have net access, there are companies which provide ready-compiled versions as well as source and support, typically for a fee.

Further readings

1. *Programming Perl* by Larry Wall and Randal Schwartz.

Larry Wall actually developed Perl. However, like many manuals written by the author of the software, this publication is not the best introduction to the language. The index was designed specially to make you tear your hair out. But once you've got started, this book serves as a useful and readable reference manual.

2. *Learning Perl* by Randal Schwartz

This is probably a better place for beginners to start.

Both books are published by O'Reilly and Associates. If you have any trouble finding them, contact International Thompson Publishing on 0171 4971422.

Niall Mansfield is the managing director of User Interface Technologies. He can be contacted by phone on 01223 302041 or by email as `nmm@uit.co.uk`.

```
#!/usr/local/bin/perl

open(TPL, "mm.tpl") || die "Can't open file";
@template_lines = <TPL>;
close(TPL);

while (&get_record())
{
    # split each line of data record into tag/text
    pairs in 'vals'
    $* = 1; %vals = ('junk', split(/^[ \t]*([^\:]*):[ \t]*/, $record));

    # remove trailing newlines;
    chop(%vals);

    if (!$vals{"contact"})
    {
        printf STDERR "%s: empty contact\n",
        $vals{"organisation"};
        $vals{"contact"} = "Occupant";
    }

    foreach (@template_lines)
    {
        @pieces = split (/(<[^\>]*)>)/;
        $i = 1;
        foreach (@pieces)
        {
            if ($i & 1)
            {print $_;}
            else
            {print @vals{$_};}
            $i++;
        }
    }

    sub get_record
    {
        $record = ''; # ensure no junk from last time

        if (eof(STDIN))
        { return(0); }
        while ($_ = <STDIN>)
        {
            last if /\[ \t ]*$/; # blank line is end-of-rec
            $record = $record.$_;
        }
        return(1);
    }
}
```

Figure 3 - Merging record and template in Perl

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Privacy on the net

The main advantage of the Internet is that it is accessible to so many people.



But what if you don't want all these people to know your every action? Paul Richardson advises...

When discussing the Internet, I am often asked to comment on its inherent insecurity, due to the distributed nature. The (justifiable) lack of confidence in the Internet can result in a less than wholehearted adoption by any organisation that wishes to keep its data transactions secret. This stifles the growth of the Internet. An immediate effect of having a secure communications channel over the Internet would be a rapid growth in mail-order companies taking credit card orders. There is currently a perception that passing credit card numbers over the Internet is 'dodgy'. An email message passes through several host computers before reaching its final destination could be intercepted at any point in the chain.

Fortunately there is a solution which should satisfy all but the most paranoid of current or potential Internet users. The technique is called end-to-end encryption. A method by which data is encoded on the source computer, not appearing in plain form until it reaches its destination. Regardless of how many hosts the data passes through, or in which organisations these hosts reside, the message will be safe from prying eyes.

In this article I will deal with two main subjects. The first is that of the contentious Clipper chip, and the other is that of *Pretty Good Privacy (PGP)*, a public domain encryption package.

To Clip or not to Clip?

In April, 1993 the American government announced its support for a government-sponsored data encryption technology code-named Skipjack. This was part of Capstone's long term project to develop a set for

publicly-available cryptography. The electronic embodiment of the Skipjack algorithm was the Clipper chip. Clipper is a key escrow encryption system. The way it works is that an 80-bit key is split into two halves and held in escrow by two Government agencies. To recover the key and decrypt messages, both parts must be known. The target applications were voice, data, fax, cellular phone and video communications. In other words, the major forms of communication. The US government had planned eventually to put onto a single chip the entire Capstone system, a bulk data encryption algorithm, a digital signature algorithm, a key exchange protocol and a hash function.

This move sparked off considerable concern. Initially amongst civil liberties groups, and then across the country. There were fears that the government would mandate the Clipper chip as the only means to encode communications data electronically; outlawing all other techniques. 'If privacy is outlawed, only outlaws will have privacy'. In addition to this the Government would hold the keys to unlock *all* data encrypted by *any* Clipper chip that has ever been manufactured. This would mean that Government agents would be able to tap the communications of any individual in the country. The Government protested that a warrant, similar to the search warrants available now, would be required. Curiously, this did not satisfy software developers or civil rights advocates. In addition, any interested party would have to corrupt as few as two key members of the escrow agencies in order to gain access to Clipper encoded information.

The American IT industry was also against Clipper as it meant added production cost. This would put them in an uncompetitive situation with the rest of the world. AT&T was the notable exception as it was manufacturing the Clipper chip.

Clipping Clipper

The Skipjack algorithm is classified and so was kept secret, although there was actually no need for this. A good algorithm should be able to stand up to close scrutiny. However the Government had claimed that Clipper was unbreakable. So the NSA (National Security Agency) quietly invited a small group of encryption experts to 'test' the

```

-BEGIN PGP PUBLIC KEY BLOCK-

Version:                2.6

mQBNay7OrY4AAAEcAMy1FEZ5/sam2z88r3omndRUmc21UUxSDZDxZ0Wx63c5r/tT
bEJQXInAafFuICw fe6j/JMiMwB3PvDSS22A0EABRG0K1BhdWwgQiBSaWNoYXJk
c29uIDxYXVsUkBNb3Rpdj5kZW1vbi5jby51az4=

=RQUW

-END PGP PUBLIC KEY BLOCK-

```

Figure 1 - My public key

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The Cyber-King speaks

'I tend to think of the Net as something rather wonderful'

William Gibson is a man of contradictions. His first science fiction novel *Neuromancer* introduced the world to the concept of Cyberspace, to the Internet. He is one of the acknowledged founders of the cyberpunk 'movement', a genre of fiction which believes that as technology rises so the ecology will decline. These tales of tomorrow often set a scene which, to the man in the street, may seem a little pessimistic. A little depressing.

However Gibson is also a member of the Global Business Network (GBN). This is a small Internet-based consultancy company which lists AT&T, ABC and the Pacific Gas and Electric Company among its clients. GBN is an innovative and respected collection of experts and renegades. They are paid to 'project' possible futures thereby enabling clients to avoid possible worst-case scenarios. And the skill with which they are doing this is quite startling. So he makes a living out of futurism. He invents scenarios which may or may not happen. Sometimes they are published as novels. Sometimes they are suggested to the GBN. If his novels are anything to go by things are looking pretty bleak for us Westerners. But Gibson disagrees. 'I tend to view my novels as rather wistfully optimistic,' he retorts.

Nothing about Gibson quite fits the way you think it's going to. He's ridicu-

lously hard to get hold of, but once you do he is helpfulness itself. He has been attributed in many corners as being a key player in cyberpunk, of inventing the aforementioned Cyberspace. Yet he emphatically denies both of these claims. Not only does he refuse to believe that cyberpunks even exist, he is extremely sceptical about the suggestion that he may have invented any tangible product within his novels. 'The Internet historically' he points out, 'can in no way be said to be based on cyberspace.'

Which is a fair comment. Nobody would try to suggest that Gibson in any way invented, or even influenced, the initial ideas for the net. But the fact is Gibson did coin the term cyberspace. And the very existence of this word, and the concept it embodied, started people thinking. Sure, there were probably a lot of people already thinking these ideas: the cognoscenti, the elite. But Gibson took these ideas to the masses.

Gibson lives in Vancouver, Canada. But his contacts on the net appear to keep him closely in touch with neighbouring America. He is a joyful proponent of the power of the Internet: 'The Net is such a wildly happening phenomenon. It is out of control.' But, like many others, he seems less optimistic about the dawning 'Information Superhighway'. 'I tend to think of the Infobahn as a commercial entity, just another form of media-biz. The interests who want to build the Information Super-

highway, I imagine, want to do so because the Net, overall, is so bafflingly, so basically *non-profit*.'

This issue of the 'wild' nature of the Internet is precisely what has endeared it to so many users this far. At present Netusers still pride themselves on their individuality, revelling in the Nets diversity. Which isn't surprising: the Net was founded by computer 'boffins' and academics.

In a recent interview with *The Sunday Times*, Bill Gates was held up as the Henry Ford of our time. Praise, or a damning analogy? True, Ford revolutionised the car industry and made it possible for the working man to buy his own vehicle. 'The idea of Bill Gates as the face of the future is sufficiently melancholy, in its low-key way, to seem all too likely.' Gibson comments, although he adds that 'the house Mr Gates is currently building for himself does give one hope.'

Possibilities are Gibson's stock in trade. It is possible that cyberspace/the information highway will exist. It is possible that they will flop like a turkey. It is possible that these emerging information technologies will provide greater freedom for the populace. It is possible that they will simply provide governments with a very satisfactory method of monitoring people's movements. All things are possible and he is fully aware of this. But Gibson remains hopeful. 'I have a certain faith in human diversity,' he comments.

Melanie Welsh

Clipper chip. None of them managed to break the Skipper algorithm. But young researcher for AT&T's Bell Laboratories, Matt Blaze, managed to damage it seriously.

Blaze discovered a design flaw in the 'backdoor' of Clipper, the Law Enforcement Access Field (LEAF) created and sent with every message. The detail of this field is classified but it is known to contain a session key used to encrypt the message. To communicate between two Clipper equipped devices the LEAF requires a correct checksum but its content is not used. It is needed, however, by the government to tap the conversation. This checksum uses a 16-bit key. Since any random sequence of 16 bits has a 1 in 65,000 chance of passing the test, it's a simple matter of number crunching. The bottom line is that government agents would not know if they have a

valid LEAF. So with limited computer power, it would be possible to replace the original LEAF with a bogus one. This would prevent the government from decrypting the communication.

This discovery, as well as public and world pressure resulted in a government retreat from Clipper. Its role now has been reduced to voice communication encryption only.

Pretty Good Privacy

The Clipper case brought to the fore the realisation that some other form of encryption was needed to 'protect' from Government snooping. I met someone at a wedding recently who works in a country that was part of the former USSR. His job is actually completely innocuous, but he is aware that there is great suspicion of all foreigners in the country and that his letters are frequently intercepted. Having strong objections to

this treatment he has recently started to use Pretty Good Privacy (PGP) encrypted email for his more private communications. Of course it could be argued that in doing so he will only succeed in attracting more unwanted attention. However, the point I'm trying to make is that he was able to obtain the technology to keep the state at bay without much trouble.

Free the bits

PGP is rapidly becoming the de facto standard for Internet encryption of email (in the Privacy Enhanced Mail Internet's proposed standard) and WWW commercial transactions. It is also finding application as a technique for securing files on local machines through its conventional single key algorithm.

Pretty Good Privacy, to use the words of its creator, is 'guerrilla freeware'. American

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➤ CIRCLE NO. 921

Phil Zimmerman took the well-respected Rivest-Shamir-Adleman (RSA) public-key encryption algorithm and used it as the basis for PGP. Somewhat understandably, RSA was none too pleased with Zimmerman giving its algorithm away for free, when it could be making a profit on it. Zimmerman was branded an 'intellectual property thief'. The RSA demanded that PGP be removed from the Internet and all US academic insitutions.

However, the issues surrounding the patents seem to have been smoothed out in the US. There are currently two freeware versions of PGP and one commercial one. PGP 2.6 was released by the MIT on May 26, 1994. It is the latest version and incorporates the freeware product RSAREF, which contains the algorithms that PGP had originally violated. Because of the license agreement, on September 1st, 1994, this version changed the data format of messages. It is now it incompatible with older versions of PGP, although it will still be able to read messages generated by older versions. ViaCrypt released a commercial version PGP 2.7 implementing this change of data format. The situation is still not clear regarding the legality of exporting PGP 2.6. But there is a version of PGP that has been developed outside of the US called PGP 2.3a, which has no restrictions. However PGP 2.3a is not able to read the new message format.

According to the MIT, the modifications required to read and generate the new data format are relatively straightforward so a new version should appear soon. PGP has been available as either source or binaries on the Internet since its creation. But now its legal. If, however, you want to create a commercial application using PGP you must buy a commercial implementation from ViaCrypt. This includes royalty payments but works only if you are in the States. You have been warned.

To abide by the law, before downloading PGP you must check that the US government does not have any restrictions on exports to your country. Encryption software is classified as munitions under US export law. For this reason, Phil Zimmerman has fallen foul of the US Customs for allegedly breaking export regulations. Controversial stuff! Some suspect that a lot of the problems that he is encountering are as a result of his opposition to the Clipper initiative. The nub of the case seems to be that since copies of PGP were put on American Internet sites and that these sites can be accessed from anywhere in the world, Phil Zimmerman is effectively responsible for people downloading the software from outside the US, ie exporting it.

Encryption evangelism

When Phil Zimmerman wrote PGP he was looking beyond simply the security of the message to its authenticity. In other words, is the message from whom it purports to be and has the message been tampered with? We will start, though by looking at the encryption technique.

The method used is known as 'public key encryption' and involves making use of a secret key and a public key, which are related to each other. To send a private message to Fred, I would use his public key to encrypt the message and he would use his secret key to decrypt it. For Freda to send secret mail to me, she would make use of my public key and I would decipher it using my secret key.

The important point is that encryption performed with a public key can only be decrypted with the corresponding secret key. Knowledge of the public key cannot be used to determine the secret key.

Slow but sure

The great advantage that public key methods have over conventional single key methods, where the same key is used to encipher and decipher, is that it is not necessary to have a secure channel for exchanging keys. One of the disadvantages is that public key algorithms are generally considerably slower than their single key counterparts. I have already mentioned that PGP has a facility for single key encryption, and, in fact, a rather clever combination of the two methods is used during normal operations. This overcomes the slowness of the pure public key method.

At the time of encryption a pseudo-random number generator produces a temporary session key. With this key and a single key encryption algorithm known as IDEA, the message is encrypted. The result is known as 'cyphertext'. Then the session key is encrypted with the recipient's public key and attached to the cyphertext. Upon arrival, when the recipient invokes PGP to act on the message, the user's secret key is used to decrypt the session key. Then the IDEA algorithm is used to decipher the cyphertext.

Because public key methods have been touted as being 'state of the art', there is a perception that the use of a single key method for encoding the body of the message is a weakness in PGP. Of course PGP is only as good as its weakest encryption algorithm. But this fear is completely unfounded. PGP uses a 128-bit key in the IDEA cipher and a 1024-bit key in the RSA one. According to crypto-analysts, the time/power to crack 128-bit IDEA key would be the same to crack a 3100-bit RSA

Cyberbits

The role of hackers within society:

'The trend, in America at least, is for older hackers to attempt to become computer security consultants. I haven't heard of any who've been terribly successful. Perhaps for the same reasons that it might be problematic to advertise that all guards in a private security firm were required to have once been working burglars.'

Data encryption and its possible manipulation:

'The Clipper Chip proposal tells us, if nothing else, that Big Brother is *quite* utterly without a clue.'

State manipulation of information:

'Governments aren't usually very good at advertising. But the private sector is.'

Shopping on the Net:

'It reminds me of when they told me that word processing would allow me to save paper.'

Researching the future:

'Channel-surfing is the optimal mode (as long as you don't make the mistake of trying to do it with television).'

And e-money:

'Global e-money will be introduced on August 15, 2007. I have spoken.'

William Gibson

key! IDEA also seems to be more resistant than the DES algorithm.

Each PGP user has a public/secret key pair. These are generated in a truly random manner, based on an exercise of hitting random keys at random intervals.

It's really you

The sender of a message can 'sign' it using a special process that makes use of his own secret key. When a user signs a message, PGP creates a 'message digest' of the message using a 128-bit one-way hash function. The purpose of this 'message digest' is to represent the message in its original form, rather like a checksum, for the purpose of detecting changes. This 'message digest' is then encrypted with the sender's secret key, before being attached to the message. A time-stamp of when the signature was made and the key id of the secret key used to sign it are also attached. The message is then ready to be sent. This signature can be verified by the recipient using the sender's public key. It is infeasible for someone to tamper with the message in such a way that it will still have the same 'message digest'. Hence we have a means of verifying the authenticity of content in addition to authorship.

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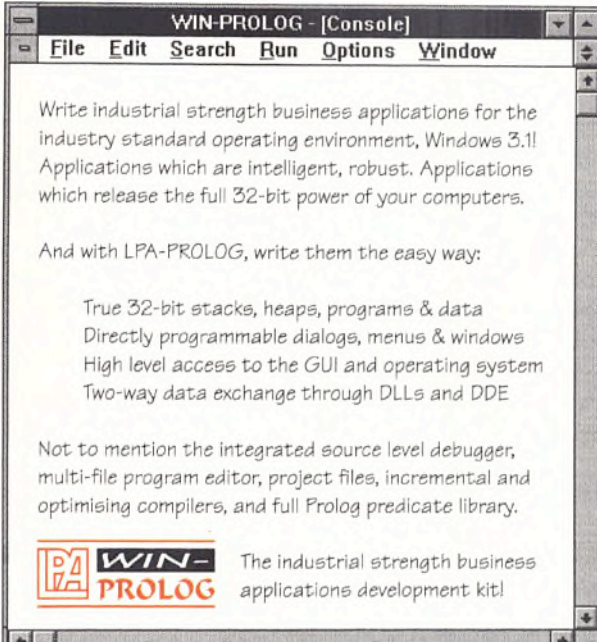
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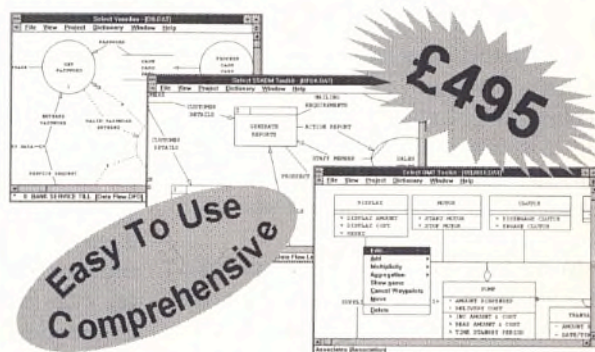
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On subject line	Effect
ADD	Your PGP public key (key to add is body of msg)
INDEX	List all PGP keys the server knows about
VERBOSE INDEX	List all PGP keys verbose format
GET	Get the whole public key ring
GET userid	Get just that one key
MGET regexp	Get all keys which match 'regexp'
LAST days	Get the keys updated in the last 'days' days

Figure 2 - PGP key server email commands

Frequently, the operations of signing and encrypting will be combined such that a message can be sent and received with the confidence of knowing that it will be private and that the content and authorship can be verified. In this case, the message is first signed with the sender's secret key and then encoded with the recipient's public key, which is then prepended to the message. The receiver's PGP software will reverse the process. It will first decrypt the message using the recipient's secret key, then check the signature with the sender's public key.

It should also be mentioned that PGP will automatically compress and uncompress encrypted or signed material at the appropriate times using a PKZIP-like algorithm.

Managing keys

Key management is the third task that PGP performs, providing facilities for handling public and secret keys. Both public and secret keys are held in 'key certificates' which comprise a key id, user id, generation time stamp and the key itself. A 'key id' is actually the lower 64 bits of the public key. To all intents and purposes it will be unique, while the 'user id' is just the user's name. Secret key certificates are also encrypted with a pass phrase to prevent them being used without authorisation and to deter theft. The pass phrase must be remembered as it is frequently asked for when performing PGP actions. Don't fall into the trap of thinking that the key pair is based on the pass phrase. It isn't. The pass phrase can be changed at any time.

Key certificates are kept in collection files known as 'keyrings' to facilitate maintenance and searching. A local secret keyring will hold the key certificates of all the local users that have encrypted material sent to them. A local public keyring will contain the key certificates of all the remote recipients of encrypted messages.

Key collection

Collecting public keys can either be proactive or reactive. In other words you may add a public key to your keyring because someone has decided that they want all future communication with you to be encrypted and so has sent you their public key. Or, you may find yourself wanting to initiate encrypted communications with someone, in which case you could mail them to ask for their public key. PGP provides a facility to take a copy of a single key certificate from a keyring for the purpose of giving it to another party (see Figure 1 for my public key).

There are a variety of methods for disseminating public keys. Some people make their public key available by returning it if you *finger* their host computer. A scheme that is becoming popular is to use publicly accessible 'PGP Key Servers' to which people send their public keys so that they can be retrieved by anybody. Typically, the access method for a Key Server is email, but I have recently come across an experimental Web-accessible Key Server.

Key forging

Phil Zimmerman readily accepts that the weak link in the chain is that of vouching for the authenticity of public key certificates. If a key certificate is replaced with a new key certificate containing a key that someone else has generated then the system breaks down. Anyone trying to make use of the 'new' key to decrypt material from the genuine owner will be unable to. Worse still, the 'new' key owner will be able to masquerade as the original.

To combat this, PGP supports a system whereby the keys themselves can be certified. In other words they can be signed by any number of people who are prepared to swear its authenticity. Thus the more signatures that a public key has attached, the

more it can be trusted. PGP will automatically calculate a trustworthiness value of a key when making use of it, and inform the user of this value. The value is a function of the number of signatories and the trustworthiness of those who have signed the key. PGP can be configured to refuse to use a key which has a trust value below a certain level.

If there is any cause to believe that a key has been compromised then a 'key revocation certificate', signed with your own secret key, must be raised and disseminated as soon as possible. Upon receipt of this certificate, public keyrings will be updated with it and PGP will be prevented from ever using that key again, thus freeing the compromised user to generate a new key pair.

One way to verify the probity of a public key is to compare what is known as the key's 'fingerprint' with a potential communicant over the phone. A 'fingerprint' is a 16 byte summary of the key's components.

In closing

I am all too aware that this hasn't been the most straightforward of topics to deal with. But I just hope that I have at least managed to convey the essentials in a coherent manner. As is usual now, the Bibliography contains pointers for further reading and sites where PGP can be obtained for a variety of platforms. I will be continuing on the topic of PGP next month, concentrating on practical use of PGP and the plethora of support software available such as GUI front ends.

Paul Richardson is a Director of Motiv Systems Ltd, a consultancy specialising in Open Systems, interoperability and the Internet. He can be contacted on 01223 576318 or by email at PaulR@motiv.demon.co.uk.

Bibliography	
Cryptography newsgroup	sci.crypt
PGP newsgroup	alt.security.pgp
PGP FAQ	ftp://ftp.netcom.com/pub/gbe
UK PGP Key Server	pgp-public-keys@pgp.ox.ac.uk
WWW PGP Key server	http://www-swiss.ai.mit.edu/~bal/pks-toplev.html
Unix binaries	ftp://ftp.demon.co.uk/pub/pgp/pgp26ui-src.tar.gz
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Atari binaries	ftp://ftp.tu-clausthal.de/pub/atari/misc/pgp/pgp26uib.lzh
Archimedes binaries	ftp://ftp.demon.co.uk/pub/archimedes/ArcPGP23a

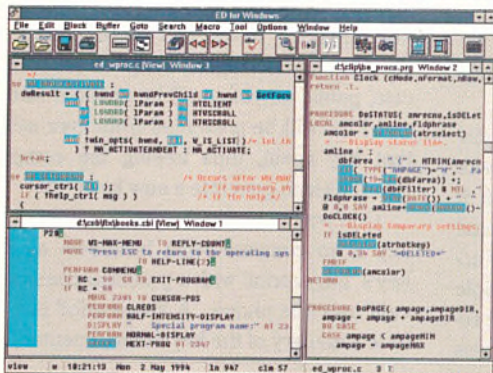
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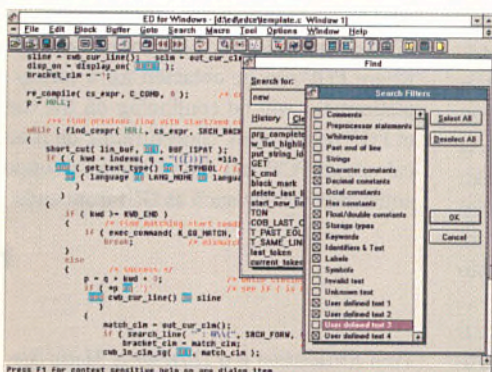


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➤ CIRCLE NO. 918

Book Review

Plug and Play Programming - reviewed by Edward Kenworthy

In the world of hardware each component is connected through an external connector of some variety. This allows components to be 'plugged' together in a standard way. The implications are that this allows them to be substituted by another model so long as the connector is the same. Expansion cards for the PC are a possible example, as are the clock doubled versions of the 486 chip.

William Wong proposes that such a model applies equally to the software world whereby software components are interconnected. Wong christens the mechanism as 'plug and play programming'. The idea is that you produce a pair of classes that are designed to be connected. In order to make all the connections you simply say 'A connects to B'. This would cause all the necessary pointers, references etc to be set up between the two objects in one atomic action. Also, what connections exactly are es-

tablished is hidden from whoever is actually causing the connection to be made. It's the standard software engineering virtue and any object conforming to the interface can be connected.

This sounds like a marvellous idea doesn't it? Well, yes it does, in an abstract theoretical way. Which is exactly where the emphasis stays throughout Wong's book. After only a few chapters I was desperate for a real example. Rather than abstract-A connecting to abstract-B, it would have been nice to have real-world examples. These are noticeably and annoyingly missing. In addition the 'interface' is actually a class. So if my class 'A' is designed to connect to class 'B', then that's all it can ever connect to. I can't add a new class 'C' and connect that to 'A', unless I derive it from class 'B'. The only reason for the inheritance being to connect 'C' to 'A', which, in my opinion, is abuse of

inheritance. If you were confused by that example, then you can begin to appreciate how a whole book of such abstract examples can begin to wear.

Whilst 'plug and play' programming may be a good idea, William Wong's book fails to take it beyond the theoretical realm to demonstrate how it could be applied practically, and of course, whether it *could* be applied practically. An excellent theoretical solution to a problem that's never really defined in practical terms.

Verdict: Not recommended.

Title:	<i>Plug and Play Programming</i>
Pages:	484
Price:	US\$39.95
Author:	William Wong
Publisher:	M&T Books
ISBN:	1-55851-302-7

Snow Crash - reviewed by Melanie Welsh

Hiro Protagonist is a freelance hacker, a pizza delivery boy and a god. Accordingly he splits his time three ways. Gathering intel for the CIC. Defending the honour of the Cosa Nostra pizza company, possibly the world's first Mafioso food-chain. For preference, however, Hiro favours 'goggling in' to the Metaverse which he helped to create. The Metaverse is Virtual Reality taken to its logical conclusion. When your real home is a 20 by 30 in a U-Stor-It, the Metaverse is the place to be. It's the ultimate escape from reality.

Bob L Rife is richer than God. But then, Snow Crash is older than God. Biblical references abound in a novel that is both futuristically modern and 'prehistoric'. Yet the many contrasts in *Snow Crash*, even the incongruencies, never really hit you until you sit down and think about it. *Snow Crash* flows off the page and straight into your imagination. Kind of like an Arnold Schwarzenegger film, it manages to bypass disbelief because it is going so fast there's no time to think about it.

Fantastic characters abound in *Snow Crash*. There's Raven the homicidal mutant. And YT, a 15 year old Kourier. She's a skateboard chick who radiates attitude. And tucked in every available space on her body suit are the very latest gadgets to keep her on the streets in one piece. Favourite is the formidable Dentata: the ultimate in personal body protection... And no, I'm not going to tell you, it'll spoil the story.

The novel is based some 20 or 30 years in the future. Just far enough to make the developments in technology believable for the average reader. But not so far that Stephenson can't make use of his ability to ridicule the peculiar banalities of American life. Perhaps best is the new design pizza delivery box with built-in LED display. If your pizza isn't at your house within 30 minutes of ordering, this box will know. And it will do something about it too.

Writing about the future in a post-apocalyptic style is no longer new, it is not even snappy. But Stephenson keeps a firm grip on reality. This is no ride on the Cyberpunk

gravy train. In a whirl of street smart humour Stephenson unfolds a world that bodes ill for us Western countries. *Snow Crash*, you see, is a virus. But it is also a drug and a bitmap. Oh, and it's the ultimate weapon for world domination.

In *Snow Crash* it's never quite certain who's working for whom. Or for what. I have to admit that I'm a sucker for a conspiracy theory. And *Snow Crash* obliges most happily. But this, in part, is what makes *Snow Crash* so real. After all, the basic human instincts of greed and violence never really change that much. *Snow Crash*, in parts, is just that little bit too believable.

Verdict: Utterly exhilarating

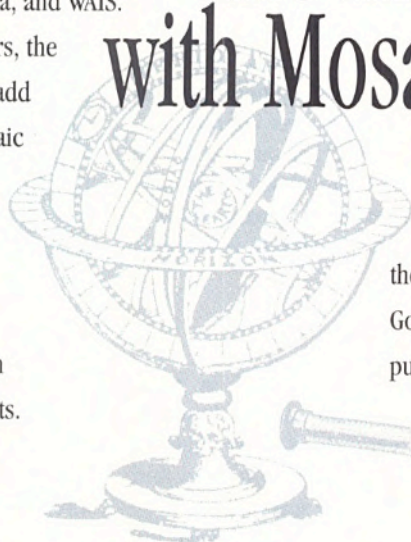
Title:	<i>Snow Crash</i>
Pages:	440
Price:	£4.99
Author:	Neal Stephenson
Publisher:	Penguin
ISBN:	1-55851-302-7

New Books					
Title	Author	Price	Publisher	ISBN	Pages
Programming With Class	Neil Gray	£25.00	John Wiley & Sons	0-471-94350-9	623
Constructing Language Processors	Randy M. Kaplan	£32.95	John Wiley & Sons	0-471-59753-8	462
Unauthorized Windows 95	Andrew Schulman	£28.99	IDG	1-56884-169-8	593
The Internet Navigator	Paul Gilster	£21.95	John Wiley & Sons	0-471-05260-4	590

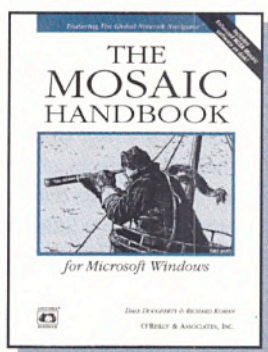
Mosaic is an important application that is becoming instrumental in the growth of the Internet. These books, created for Microsoft Windows, X, and the Macintosh, introduce you to Mosaic and its use in navigating and finding information on the World Wide Web (WWW).

It shows you how to use Mosaic to replace some of the traditional Internet functions like FTP, Gopher, Archie, Veronica, and WAIS. For more advanced users, the books describe how to add external viewers to Mosaic (allowing it to display many additional file types) and how to customize the Mosaic interface, such as screen elements, color, and fonts.

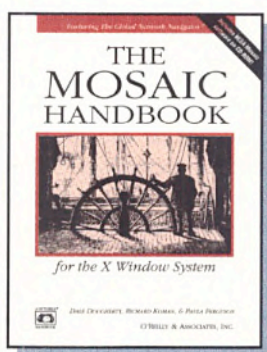
All you need to know about navigating the Internet with Mosaic



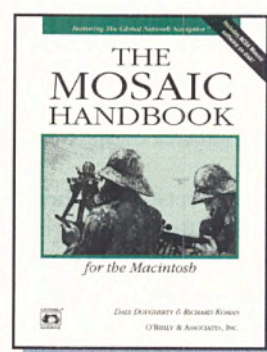
The Microsoft and Macintosh versions come with Enhanced NCSA Mosaic on diskettes; the X Window version comes with NCSA Mosaic on CD-ROM. All three books come with a subscription to The Global Network Navigator (GNN®), the interactive guide that makes the Internet more enjoyable and easier to use. Another new O'Reilly book on a much-requested topic is *Managing Internet Information Services: World Wide Web, Gopher, FTP, and more*. It describes in detail how to set up information services to make them available over the Net. It begins by discussing why a company would want to provide Internet services and how to select which services to provide. Most of the book describes how to set up email services and FTP, Gopher, and World Wide Web servers. This book will be published in December.



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(ORACLE conversion project)
6 months, start Mid Jan '95

NOMAD invites enquiries from first time and existing contractors of all skills and disciplines. Feel free to call Michael Barron on 081-686-7171, 081-680-1212 or 0732 886808 Evenings/Weekends



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CONTRACT OPPORTUNITIES

SOFTWARE ENGINEER (ref BB/C334)

Experience of GUI development on APPLEMAC machines for cross platform development.

SOFTWARE ENGINEER (ref BB/C351)

Strong C, UNIX and WINDOWS 3.1 experience required for 6 months assignment. Thames Valley.

SOFTWARE ENGINEER (ref BB/C359)

Real-Time software design and development using C and ASSEMBLER. Experience of YOURDON required.

DSP ENGINEER (ref BB/C362)

Extensive experience developing FIRMWARE in low level C and ASSEMBLER for telecom applications.

ANALYST PROGRAMMER (ref BB/350)

ORACLE V6, FORMS 3 developer required for 3-6 month contract. Experience of UNIX and strong analysis skills desirable.

C++ DEVELOPER (ref SH/C314)

WINDOWS SDK, C++ required for this very interesting assignment. Exposure to OLE and other leading edge tools.

SOFTWARE ENGINEER (ref JB/C361)

Real-Time programming experience within PC/UNIX/WINDOWS NT environment. Initially 2-3 month contract.

SOFTWARE ENGINEER (ref JB/338)

WINDOWS 95 development experience. Knowledge of MAPPI SMALL and/or MULTI-THREADED INTERFACES desirable.

For more details contact Bob Brown or Jo Brown on
0296 393636

Fax 0296 82621, or write, enclosing your CV, to
Orion Contracts, The Courtyard, Merlin Centre,
Gatehouse Close, Aylesbury, Bucks, HP19 3DP

Multimedia Software Test

LONDON to £25,000
This exciting young company are recognised leaders of the development of shrink wrapped multimedia software. They are looking for two dedicated software testers to join a completely new team in the uncharted waters of multimedia software testing. You will undertake software and configuration testing, localisation testing and establishing bug tracking systems for both PC and Macintosh titles prior to release which will require you to be fluent in MPC or Macintosh software testing using appropriate tools. This must be the best software test role available.
Ref: MJ0101

Software Artists

Essex to £25,000
This young dynamic developer of graphics software is seeking enthusiastic engineers who want more than just another programming role. You need at least twelve months indepth MS Windows and C++ experience and have the wish and ability to develop 'state of the art' software either in a team environment or one man projects. Preferably you will have experience of one of the following Windows SDK, OLE, Database design and WIN32. Future projects will lead you into Windows NT and Chicago.
Ref: AW0100



Call Mike Jenkins or Adrian Wagstaff on 0442 231691 days or 0908 222909 eves/weekends. Alternatively send your cv to: Executive Recruitment Services, Boundary Way, Hemel Hempstead Herts HP2 7RX or fax cv to 0442 230063.

DOS - BIOS

South West to £24,000
An exciting opportunity exists for Software Engineers with at least 3 years PC software development experience. You will be developing leading edge real-time data management software working within a small dedicated team. You will have graduated with a good degree and have in-depth understanding of MS-DOS at device driver and interrupt level. You need also to be fluent in C and 8086 Assembler and have the ability to deliver quality software on time. Good opportunities exist to progress to other environments such as WindowsNT and Novell Netware.
Ref: AW0102

Digital Audio/Video Effects

London to £30,000
Real time video in WINDOWS, 30G byte real time systems, object orientated design and development, sophisticated GUI font ends. Sounds amazing doesn't it? Well it is! If you are a young, bright software or hardware engineer, have C or C++ experience from an audio or video background and equally importantly, have a real enthusiasm for video / audio systems or techniques this is the company for you. A highly creative atmosphere within a thriving ground-breaking company.
Ref: MJ0103.

WINDOWS DEVELOPERS

WINDOWS NT

CITY

We require a Software Engineer with experience in at least one Windows NT system, coupled with a background in C++ and MSWindows or XWindows. The position is to join a small team developing rapid response systems in a client server environment. For more details please call. Salary to £30,000 + excellent benefits. Ref: TJ / 1E.

XWINDOWS CONSULTANTS

LONDON

This specialist in UNIX consultancy and development require additional degree educated developers. The positions will involve developing solutions for blue chip and financial clients within the city. Ideally applicants will have at least 3 years UNIX and C / C++ experience coupled with solid XWindows / Motif. Salary £25 - £30,000. Ref DL / 2E.

CLIENT SERVER DEVELOPMENT

S/HERTS

This small software house (30 strong) require two additional Software Engineers to work on the development of Client Server applications. Applicants will need between one and three years experience in MSWindows development (at least one years C++). Call for more details. Salary £15,000 to £28,000. Ref: PH/3E

GUI TOOL DEVELOPMENT

SURREY

This is a rare opportunity to join a company producing MSWindows development tools. Skills required centre on a strong object orientated programming background using C++ and MSWindows. Applicants must have a desire to work on the leading edge of windows development in a very hands-on role. Salary upto £31,000. Ref: pH / 4E.

C++ & MSWINDOWS

READING

This company are continuing the expansion of their MSWindows team into 1995 and now require two further TECHNICAL developers. You will need between one and two years MSWindows experience using either the OWL or MFC libraries working on bespoke application development. The company can offer exciting and challenging work, training in the USA and a friendly team atmosphere. Salary £14,000 to £23,000. Ref: TJ / 5E

MSWINDOWS & C++

OXFORDSHIRE

This is an opportunity to enter the exciting world of motor racing. This company develop race car real-time instrumentation and data acquisition systems (As seen in the pits in Formula 1). Systems are developed in C++ and MSWindows utilising OOD. The company now require a senior Software Engineer with the above skills to join their small team. An ideal position for a racing enthusiast. Salary to £29,000. Ref: DL/6E.

For more information on the above or for details of our other vacancies please contact us on 0908 260910 or send/fax a CV (please quote the relevant reference number) to us at:

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INFORMATION SUPERHIGHWAY

SOFTWARE & HARDWARE DEVELOPMENT ENGINEERS

SOUTH BUCKS

to £35,000



Madge Networks is a multi-national company providing high speed computer networking products to customers throughout the world.

The acknowledged leader in Token Ring and FDDI networking, they have sustained unprecedented growth since their foundation as a UK company in 1987, with sales in excess of \$140m last year.

Madge is now developing ATM products for the next generation of high speed LAN and WAN networks, and have new vacancies in their Research and Development centre.

Candidates must be exceptional software or digital hardware designers. You should have a 1st or 2.1 in a numerate discipline from a good university and be able to demonstrate ability and enthusiasm.

Your background must include some of the following:

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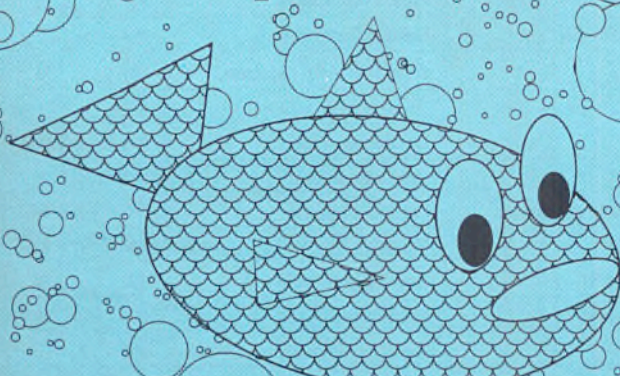
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NEW GRADUATES

£13-18K

We have had an upsurge in the number of vacancies for new graduates and/or MSc graduates with Numerate/Scientific/Engineering Degree particularly biased towards software engineering. Most vacancies do require a 2:1 or higher. Please call at any time to discuss the openings.

C++, WINDOWS 3

to £30K

Senior Software role for an Engineer to be responsible for running both commercial and technical aspects of projects. You will be working on real time control and Image Processing projects and ideally you will have a good understanding of the complete project lifecycle, programming in C, C++, and possibly WINDOWS 3. Good job for a strong team player.

CONSULTANTS (C, C++)

£45K + Bens

Major young Company based in London develop and market innovative platform-independent development tools. They are seeking young consultants with a good Degree to advise blue chip customers. You should have at least two year's 'C' and/or C++, OOD. In addition any experience of WINDOWS Systems such as MOTIF, SDK, Mac Toolbox would be an advantage.

VIDEO MULTIMEDIA

to £28K

New vac's with a leading player in the Multimedia field. They are seeking Software Engineers with experience in WINDOW drivers and SDK. The positions will involve interfacing GUIs to hardware and investigating and implementing interfaces to emerging API's in the multimedia arena. If you have a good Degree and real enthusiasm for Multimedia please call.

C, C++, UNIX

to £28K

Two new vacancies in Hants for UNIX designers to join a small and friendly design team working on the design of server applications. The roles require experience in high performance, multi-user, multi processor applications in a UNIX environment. Any knowledge of C, and/or C++ and structured methods would be an advantage.



Jones
resourcing

For further information please contact:

Paul Jones or Paul Slough on 01442 870770.
You may also fax your C.V. to the same telephone number at any time, or write with C.V. to this address: Highfield House, 26 Lower Kings Road, Berkhamsted, Hertfordshire HP4 2AB.

A/PROGRAMMERS UNIX/PROGRESS

HANTS

£ c.22k ++

All levels. This busy international Retailer is expanding its operations and is looking to recruit Senior and Junior PROGRESS A/Ps. Ideally have a minimum of 6 months PROGRESS 4 GL development experience gained in a UNIX environment. You must be willing to travel and work overseas for short periods. Negotiable salary + Bonus + Benefits. Ref:SY5/1177

SYSTEMS DESIGNER OOD, C++, OLE2

SOUTH LONDON

£30-£40K + bonus

Our client will offer you a superb opportunity to design systems used for high profiles work by some of the largest companies in the UK. You will need to be a development professional with experience of designing systems in commercial or in-house environments using OOD, C++ OLE2 Windows, and SQL/ODBC, with a professional approach to problem solving, project planning, software quality and meeting tight deadlines. Ref:SY5/1112

TECHNICAL SUPPORT SERVICES ANALYST

EAST MIDLANDS

£18-21k

Four years' experience in VMS/UNIX/INGRES environment. Knowledge of Open Door Product would be an advantage. One year's experience in HR applications and 2 years 'C' programming, together with the ability to communicate at all levels. Ref: LB/072

We are open every Saturday between 9.30am-12.30pm for your convenience.

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SOFTWARE ENGINEERS

WILTSHIRE

£14-28k +

Bright computing software engineers with upper numerical/scientific degree and very good "A" Level grades, able to adapt to different technical environments and with good communication/interpersonal skills, is the calibre looked for. At Junior level 1-2 years experience within the computer industry is required; at Senior level, a proven track record is sought. You should have at least three of the following: Windows development skills, ie Gupta, Visual Basic, Powerbuilder, UNIX and RDBMS, ie Ingres, Sybase, Oracle, Informix; UNIX, OS/2, NT, Windows; Client Server applications; SQL; 3GL, preferably C. Ref: SY6/1371

'C' OR C++ PROGRAMMER ANALYST

MIDDX

To £20k

Under MS-DOS or Windows to join a busy specialist Retail - EPOS - Software House and to be particularly involved in back-office systems which are IBM PC based. Ref: SY6/1375

CONTRACT 'C'/FIST ANALYST/PROGSx5

CITY

£ negotiable

This financial house urgently seeks 5 Designer/Programmers with strong C/UNIX Development experience, preferably with FIST (an applications development routine aimed at financial dealing rooms). Experience of VAX/VMS desirable but not essential. Duration 3+ months. Ref: SY8/1818

CONTRACT ANALYST PROGRAMMERS

HERTS

£ negotiable

With a minimum of 2 years experience using AIX or UNIX, C, SQL and RDBMS (ie INFORMIX, SYBASE or ORACLE). To work on a LOGISTICS system, initially for 9 months, possibly longer. Start dates between now and February 1995. Ref: SY8/1801.

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University Challenge

Cliff Saran investigates the problems facing graduates trying to start careers in the computer industry.

British Universities have always prided themselves on being institutions for academic excellence. Their aim is to massage the minds of their students with a broad range of subjects, in preparation for the strange new world that they are about to enter. For many students it is a very strange world indeed. They have spent their lives moving from primary school to secondary school to sixth form college to university. Only at the time they reach the third year of their degree course do the questions of employment and careers receive serious consideration. And, since they have spent the last two years at an academic institution which has aimed to broaden their minds, they are ill-prepared for work in industry.

It used to be the old-style Polytechnics that offered vocational training. But now they have all gone. There is absolutely no

point in having excellent problem solving skills and being relatively broadminded if these cannot be applied in real world situations. Such skills are essential. But we must never forget the importance of understanding the problem thoroughly in order to apply these skills effectively. If the primary function of a university is to teach our future industry leaders and entrepreneurs, then it has failed. In industry, those who make it to the top invariably rise up through the ranks from a technical background.

In the national press we often read that graduate recruitment is down. The recession effectively halted the annual intake of graduates into industry. The concept of 'a job for life' is long gone. Far too many graduates are competing for far fewer vacancies. Even for those who do succeed, job security is no longer guaranteed. Within six months they could possibly be out of work again.

The statistics for graduate unemployment are appalling. And still young people are being indoctrinated with lies and half-truths. Yes, higher education is good and

should be recommended. But it cannot ensure a prosperous future.

Actual course content can also contribute to the problem. In the computer industry we cannot afford to employ a graduate who may well be a brilliant Modula-2 programmer, when what we needed was a C programmer two weeks ago. Times have changed. And unless graduates have the relevant skills they cannot hope to find suitable employment in this industry.

To make matters worse it seems that the career offices of many universities lack the relevant expertise to help guide graduates in some industry sectors. But Richard Maynard, director of career services at Birmingham University feels that the IT sector is actually recruiting strongly, especially into business consultancies. 'Pure scientists are having the hardest time,' he comments. Traditionally graduate scientists would have entered the nuclear and defence industry. Well we all know the state they are in at present. His advice to any graduate is that they should be prepared to look flexibly, and above all, be patient. ■

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Features Editor: David Mery

Sub Editor: Melanie Welsh

Production Manager: Kate Adams

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NT SYSTEMS MANAGER



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As part of their investment in Technology, Barings are currently moving from partial to full Object Orientation and are installing Windows NT across the investment banking group. Windows NT will be the platform for Personal Computing applications and a series of planned dealing room systems.

This is a critical role within the bank and will involve the set up and running of a global NT network. Supervising a team of Windows NT technicians, you will establish an NT Lab for the testing of in-house and 3rd party applications as well as integrating NT with all Barings environments including UNIX and VMS.

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This position will provide extensive challenge and offers significant opportunity for career development.

If you have what it takes and would like to be considered for this post, contact: JANET EVANS at INNOVATION Computer Consultants, Victoria House, 64 Paul Street, London EC2A 4NA Tel: 071-613 2464 Fax: 071-613 2869

No Agencies

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PC Windows, Germany



All Powersoft's products are user friendly and applications can be easily created. US software developers consider PowerBuilder the best client/server development tool.
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PowerBuilder is a winner.
PC World, Sweden



We prefer PowerBuilder because of the tool's low price, better documentation and large number of enhanced drivers to enterprise database systems.
PC World, Denmark



PowerBuilder Desktop is an ideal tool for database development.
PC Magazine, U.K.



At least there is something they all agree on. PowerBuilder

VERSION 4 OUT NOW

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