

Building The

Copland, Apple's brand-new System software is scheduled for completion in mid-'96. **Tony Smith** takes a look at the user interface that's threatening to turn the Mac world upside down.

It's August 1995, and there's a spring in Apple R&D boss David Nagel's step. Maybe it's the sun, perhaps it's the welcome he's just received at the start of MacWorld Expo, the bi-annual American Mac fan fest; possibly it's the prospect that the soon-to-be released Windows 95 isn't quite the Mac killer the Microsoft marketing machine has made it out to be. Most likely it's the knowledge that Apple's own next major System software release, codenamed Copland, is still on course for a mid-'96 release.

time. And its arrival saw Microsoft support teams deluged with demands for help as PC after PC crashed upon installation of the new System software. Most of the problems were probably due to human error, but either way, Microsoft is big enough to carry it off.

Apple, on the other hand, can't afford the risk. If Copland is a flop, the company's reputation as leader in user interfaces would be irreparably damaged.

It wouldn't do a lot for its financial stability either.

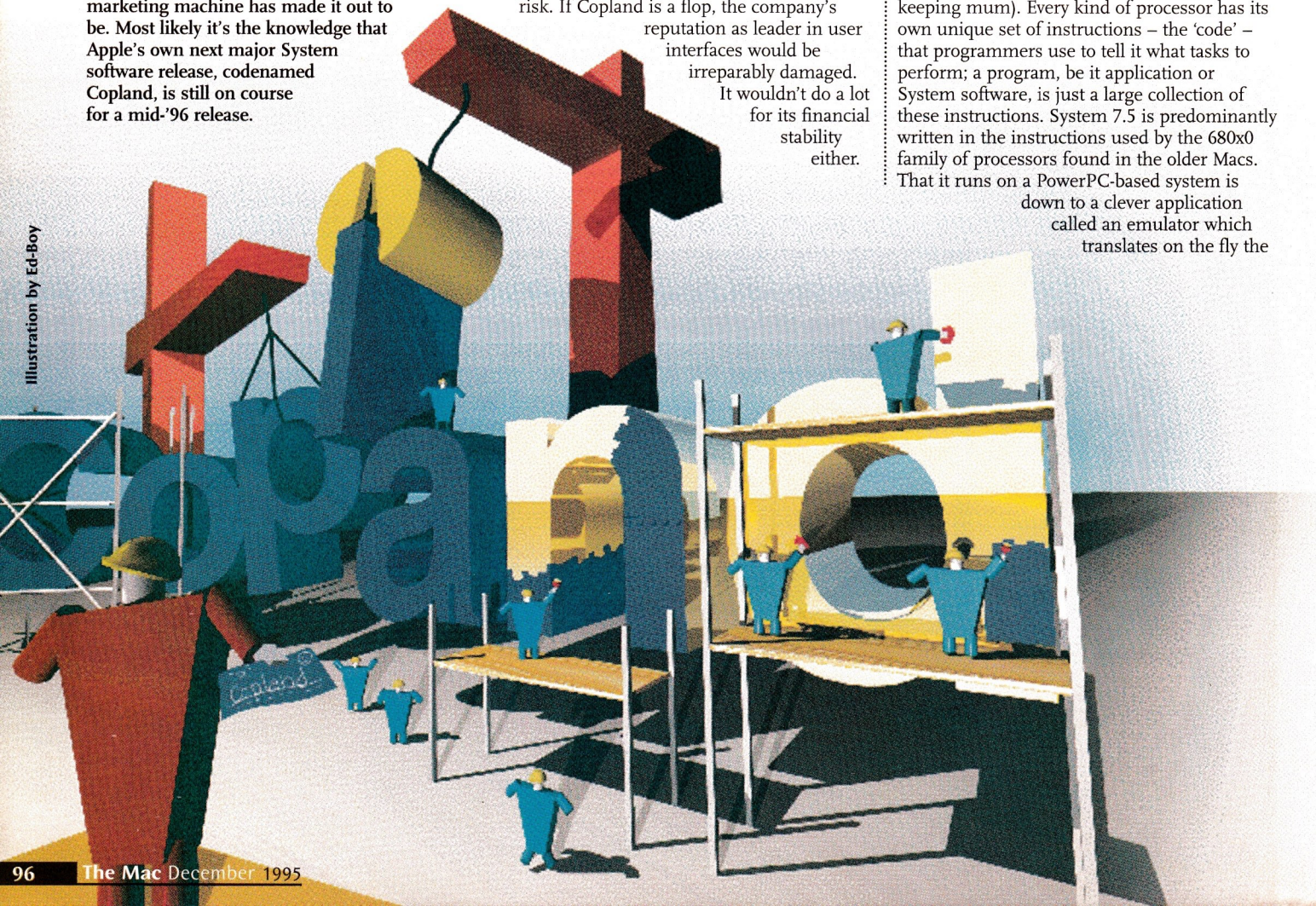
But rewriting the Mac OS from the ground up is exactly what Apple is doing with Copland. No mere bug-fixing update, Copland is to all intents and purposes a brand-new operating system. Sure, the familiar Mac desktop remains, with its folders, icons, pointer and menu bar, but the software underneath it, the program that makes the Mac do its stuff, is all new. So even though work on Copland began back in 1993, we won't see the results until the middle of next year. Apple is determined to get it right – it *must* get it right – and it's allowing itself the time to do so.

All Systems Go

So let's give Apple the benefit of the doubt – no easy task when you consider some of its past launches; the Newton springs to mind – and assume Copland does do what it's supposed to, when it's supposed to – what is it actually going to mean for the average Mac user?

If you don't own a Power Mac or one of the PowerPC-based Performas, the answer is, not a lot – around 95% of Copland is accelerated for Power Mac (what the other 5% is, Apple's keeping mum). Every kind of processor has its own unique set of instructions – the 'code' – that programmers use to tell it what tasks to perform; a program, be it application or System software, is just a large collection of these instructions. System 7.5 is predominantly written in the instructions used by the 680x0 family of processors found in the older Macs. That it runs on a PowerPC-based system is down to a clever application which translates on the fly the

Illustration by Ed-Boy



Future

680x0 instructions into code the PowerPC can understand. The upshot is that a Power Mac can run old applications and System software; the downside is it does it much slower than if it was using raw PowerPC – i.e. accelerated for Power Mac – code.

By writing Copland in PowerPC code, it will work much faster than System 7.5. What's more, because a considerable proportion of the features offered by applications are actually delivered by the operating system, a native Copland will also enhance the performance of other software.

Heart Of The Matter

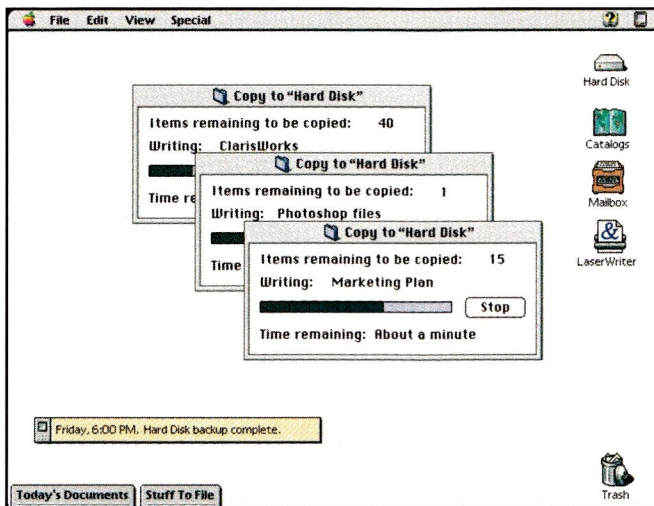
However, Copland isn't simply a translation of System 7.5 into PowerPC format. Early on, Apple decided it would use this opportunity to redesign some of the core technologies to make them perform more efficiently. So they don't simply operate more quickly because you're using a faster chip, but because of the way they're written to utilise special features of the PowerPC, such as the ability to handle more than one instruction at a time.

Take the way Copland handles memory. Anyone who's used System 7.5 with all its bells and whistles installed knows that even on an 8Mb Mac there isn't a lot of room left for most mainstream applications, certainly not to run more than one at once. For Power Macs, you're really looking at 16Mb as your minimum.

Copland, however, has a new Memory Manager that squeezes much smaller program segments into Ram than System 7.5 does. Rarely is an application loaded into memory in its entirety – instead the Copland Memory Manager loads the sections currently being used and those likely to be used.

System 7.5 does this too, but by loading smaller segments more quickly, Copland will let you have a greater number of simultaneously active programs in a smaller space. More practically, it means each application will require less memory. So Apple reckons that the whole lot will work comfortably in 8Mb of Ram rather than the 16Mb or so you need today.

The Copland Memory Manager also features a much more efficient virtual memory system – though given how awful the current one is, anything would be an improvement. So when a particular application needs more memory, Photoshop for example, it can be



Copland will let you carry on working, even while it's doing other things.

assigned it in the traditional way of using a section of the hard disk to imitate real Ram, but without the major performance hit that virtual memory users currently take.

Of course, having several applications running at once can cause problems besides those of limited memory. Even when there's plenty of Ram, two System 7.5 applications can easily intrude on each other's memory 'territory' and bang, your Mac freezes or the infamous 'Type 1 Error – Application Quit Unexpectedly' message rears its ugly head.

To prevent such incidents, Copland protects an application's memory allocation from other applications, including the operating system itself. It won't necessarily prevent applications from going splat, but it'll ensure that if they do they won't drag everything else down too.

Your Fair Share

Beyond making for a more crash-free environment, this memory protection scheme is an important component of Copland's enhanced ability to run applications simultaneously, a process called multi-tasking. Sure, you can do that right now with System 7.5, but the program you're using at any one time, the application in the 'foreground', hogs processor power, leaving little spare for anything running in the background. Copland's new multi-tasking system allots equal share of processor resources to all currently-open applications.

Apple likes to demonstrate this by copying three documents simultaneously, but 'proper' multitasking goes much further. You can, say, format a floppy in the background while you're compressing the software to go on it. Photoshop can be applying a filter to an image at the same time as you're laying out in XPress the page on which the picture will appear.

Copland is about more than making software faster and more stable, though. A

Microkernels And Modules

What with extensions and control panels, System 7.5 appears on the surface to be a pretty modular sort of operating system. In fact, it's quite monolithic, with these add-ons sitting on top of a huge chunk of program code. Copland, on the other hand, will be far more compartmentalised.

At its heart will lie what's known as a microkernel. This is a tiny chunk of software that insulates the operating system from the hardware it's running on. Copland's microkernel is a version of Mach, developed and refined by Carnegie-Mellon University in the US, the same microkernel IBM is planning to use in a future release of its OS/2 operating system, and indeed the basis for the Taligent (the system software company formed by Apple and IBM) operating system.

By breaking the link between System software and hardware, it becomes very easy to move your operating system to any other kind of computer. So if Apple wanted to, say, transfer Copland to Intel's Pentium processor, all it would need to do was produce a Pentium version of the microkernel; the rest of the System software could be used as it was. So while Apple truthfully claims that the use of a microkernel will make it easier for clone manufacturers to add the Mac OS to their own hardware designs, it also provides Apple with a handy get-out clause if, say, it decides it doesn't want to build Macs any more: it can carry on as a software company, selling the Mac OS to all comers, in much the same way Microsoft does with Windows.

On top of the microkernel sit the now machine-independent software technologies that make the Mac what it is: its file system, its networking facilities and so on. These too are modular, so that updates to one component can easily be added without having to rewrite large chunks of the others. Sitting on top of these fundamentals comes the user interface software: the Finder, the Toolbox (the set of programs that define the Mac's look and feel), extensions and, ultimately, the applications themselves.

This modularity, especially when it comes to the new extension model, should make it simpler for software developers to support new System features, and to do so more quickly.

good proportion of Apple's development efforts have gone on enhancing the ways with which you can interact with your System software. Some of them are just plain gimmicky, but others really will improve your ability to get the information you want, when you want it.

Into the former category falls the option to customise your desktop, not just by changing the background pattern and the font and colours used to display windows and menus, but the very contents of the menus themselves. In some respects, Apple's argument for this makes sense. For example, you might want

to set up Macs in a school so pupils can use all the Mac's facilities bar the Special menu's Empty Wastebasket option and the file sharing commands currently located in the File menu. Copland will let you decide which commands a user can give. For most people, though, this will be a fun but pointless exercise.

More useful are Copland's ways of using and examining folders. For example, closed folders will open automatically (and close when you're done) whenever you drag a file onto them. This saves opening several folders to get to the one you want. To save desktop clutter, open folders can be dragged to the bottom of the screen where they'll become name tags - click on them and they slide up to reveal their contents. Drawers will open and shut automatically when a file's dragged onto them.

These two items aren't immediately impressive - it's easy to see situations where they wouldn't be much use. But they're exactly the kind of facility that you soon start to use without thinking, just like dragging document icons onto their creator applications. Nowadays everyone does that, but it too was criticised initially as an 'I'll never need that' feature.

Perfect Presentation

So much for accessing folders - what about improving the way they present information? Right now, in System 7.5, a folder represents the files stored on a section of your hard disk. In Copland, they can represent not just

Exit Extensions

One casualty of the move from System 7.5 to Copland will be the dear old extension. The idea of bolting on System facilities through the use of small software modules is sound - if you want the features you can have them; if you don't, you save memory. Unfortunately, the component of the System software that controls the use of extensions isn't terribly rigorous, so extensions can easily be loaded on top of each other, leading to clashes and crashes.

Copland abolishes such disasters by introducing a whole new extension model that's more rigidly-defined than the old one. Not only will extensions be allotted their own, protected segment of the Mac's memory to prevent clashes, but the rules governing how they're designed will be clearer, allowing software writers to produce extensions they know will work with the System.

The snag is that this will mean all your current extensions, unlike your applications, won't work with Copland. Software developers whose products are based on an extension - scheduler applications, for example - will have to rewrite those components. Fortunately, most extensions are used because it's currently the only way to ensure a program is operating at all times, even when others are too. Copland's multi-tasking abilities will ensure that such applications can be loaded into memory at start-up and allowed to run continuously. This actually abolishes the need for the half of the extensions people currently have installed on their Macs.

physical locations, but list documents that could be located anywhere: on your hard disk, on floppies, on a network, even on the Internet.

Here's an example. Let's say every evening you want to archive every Adobe Illustrator illustration you worked on during the day. Just create a new folder but instead of making it display files by type or by icon, you set it to show 'All the files I modified today'. The folder then searches through all the system resources you're connected to, from networks to your own hard disk, and lists the names of the files you worked on in the last 24 hours.

The result looks like a regular folder and if you double-click on an illustration's icon, it will open as usual, but half of the items may exist on a Mac on the other side of the office. Every time the folder's opened, it checks all its pointers to remote files and modifies what it displays if any have been trashed. If they've been moved, perhaps to another folder on the host machine or even to another Mac, Copland will follow them, and they'll still appear in your folder ready for use.

This is an incredibly powerful facility, even if you use a standalone Mac. For once, you can organise your information in any way you want, even to the extent that the same item will appear in more than one folder: a letter in your Letters folder, in your Microsoft Word Files folder, in your Stuff That's Urgent folder and in your Items Created This Week folder. Each



icon points to a single file - there aren't four copies on your hard disk - but you have four different ways of pin-pointing the letter you're after.

To get this to work, Apple has essentially merged Find File... with the View menu.

There are other such mixes of features. AppleGuide in Copland doesn't just take you through tasks to show you how they're performed, but its power is combined with AppleScript to produce automatically actioned events. So, you want your wastebasket emptied every day at 5pm, just run AppleGuide's Task Manager and at the end it will ask you if you want to automate the process. Click OK, tell it when you want the bin emptied, and from that point on you never need select the Special menu's Empty Wastebasket command again.

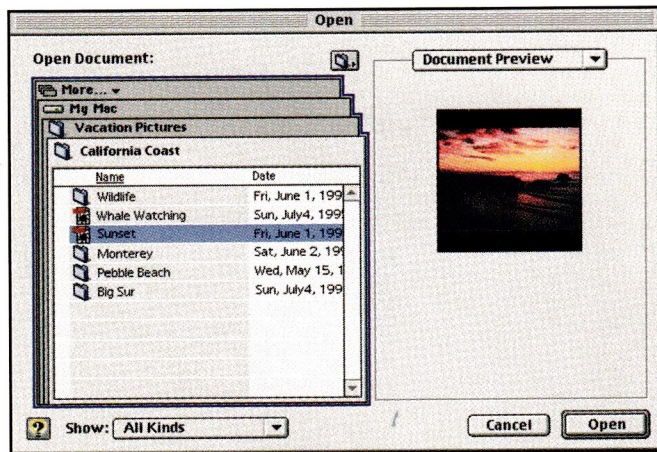
Features like these, combined with the raw power of the PowerPC chip mark Copland out as a major advance in the way we use Macs, probably in the way people use computers period. System 7.5 has been a highly popular upgrade - by July over five million copies had been installed - but it's really just a minor tweak compared to Copland.

Whether this new version of the Mac OS will deliver the goods, is something we won't find out for another six months. There've been rumours that the release time may slip, but at MacWorld the chipper Mr Nagel was insistent that the deadline will be met. Copland deserves to be an impressive and useful operating system. Let's hope Nagel's good humour doesn't prove to be misplaced.

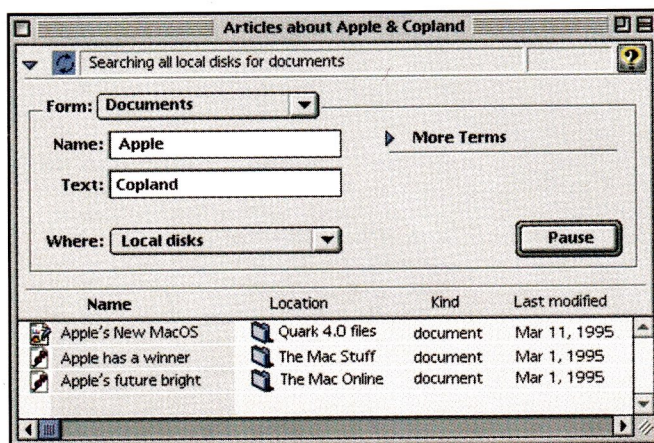
MAC

And There's More...

Many of Copland's features will be developments of technologies Apple is offering today. Facilities like QuickDraw 3D, QuickDraw GX and Open Transport will all be redesigned and rebuilt for Copland. Others, like OpenDoc, Apple's new document creation technology, which have yet to appear, will find their true home in the new version of the Mac OS. The Mac will be taking all of these Apple technologies apart in future issues.



Copland's Open dialog shows multiple folders.



The new View By Content in the View menu has a search feature.