

# Apple Plans Open Licensing for PPC Platform

## IBM and Apple Agree to Create Common Platform Definition

by Michael Slater

After years of indecision, Apple has finally made the bold move of committing to fully open licensing of the Macintosh operating system. Remarkably, this revelation was almost hidden in the announcement of a common Apple/IBM/Motorola hardware platform and thus was missed in much of the press coverage. Although the results will not appear until 1996, the shift for Apple is dramatic—it is nothing less than a reinvention of the company's entire business model.

The new hardware platform combines aspects of the current PowerPC Reference Platform (Prep) and the Macintosh system design. The new design has been internally called Moccasin but not formally named; for convenience, we'll refer to it as the CHRP (common hardware reference platform). The CHRP will add support for the Macintosh memory map and I/O architecture, enabling it to serve as a "no compromises" Macintosh.

Systems conforming to the CHRP definition will run not only Mac OS but also Windows NT, OS/2 for PowerPC, AIX, Solaris, and NetWare. Table 1 summarizes the contributions from each partner.

Draft versions of the specification are now being distributed to system makers for review. In the spring of 1995, the companies plan to make the specification openly available. Prototype CHRP systems are expected by the middle of 1995, with volume production by the second half of 1996. The long time scale is driven by the need to develop three ASICs and port and test six operating systems; it is possible that some vendors will have systems on the market in early 1996.

Apple still has not announced any licensees for Mac OS. With Apple's new licensing approach, however, any company building systems based on the common platform can support Mac OS.

The lack of any announced licensees causes some observers to remain skeptical of Apple's intent, especially given the company's long history of half-hearted commit-

ments to licensing. IBM executives have said that the company would not offer a Mac clone, but that when CHRP systems become available, IBM will offer Mac OS if its customers ask for it. IBM's lukewarm endorsement is presumably driven by the company's desire to keep its focus on OS/2.

Other companies rumored to be negotiating Mac OS licenses include Motorola, which might serve as a distributor of licensed designs to other OEMs as well as making its own systems; Asian system makers Pioneer, Panasonic, Toshiba, Samsung, and Acer; and U.S. startups FirePower Systems (backed by Canon) and Power Computing (backed by Olivetti).

### Apple's Evolving Business Model

The most significant aspect of the CHRP is not the design itself but its role as the culmination of Apple's licensing strategy. By providing a platform definition that other companies can use to build Mac OS-capable systems, it provides the hardware bedrock for Apple's open licensing of its operating system.

With the emergence of the common platform and the open availability—and eventual elimination—of Mac ROMs, the Macintosh business model will finally match the PC model. Any company, whether an Apple licensee or not, will be able to make motherboards or systems capable of running Mac OS. This will result in a wider range of systems and more competitive prices. Just as in the PC industry, Mac users will have the choice of buying from a name-brand vendor, such as Apple, or from a smaller system maker, or from a "screw-driver shop"—a company that buys motherboards, enclosures, power supplies, and peripherals and puts them all together to make flexible, low-cost systems.

When the PowerPC alliance was formed in 1991, Apple was still stuck in its proprietary system business model. The alliance with IBM was for the development of a common microprocessor technology, but there was no agreement on system architecture or system software strategy. Indeed, the companies specifically stated that their plans were to compete with disparate systems built around the same microprocessors.

Last year, following CEO John Sculley's departure, Apple's executives finally began to think seriously about licensing Mac OS. At first, Apple sought to license its OS on a restrictive basis, seeking to increase the Mac OS presence in markets where Apple was weak but stopping short of enabling direct competition with Apple's own products. Several sources reported that Apple was

Partner	Software Porting Responsibility	ASIC Contribution
Apple	Mac OS	"Cuda"—Mac I/O
IBM	OS/2, AIX	"Coral"—PC I/O
Motorola	Windows NT	"Eagle"—PCI bridge and memory control

Table 1. Each of the three partners will take responsibility for porting one or more operating systems to the common platform and will also contribute to the hardware design. In addition, Novell will port NetWare and SunSoft will port Solaris.

spurned by the major PC makers, which either weren't interested in the Mac at all or were discouraged by Apple's restrictive terms.

By this past summer, the faction at Apple supporting open licensing won out. From that point forward, restrictions on licensing seem to have been driven more by practical considerations than by any intent to restrict the opportunities of licensees. The first public step in preparation for the licensing program was the announcement of the Mac OS logo, shown in Figure 1, last September.

Apple's current system software is intimately intertwined with the Mac's hardware design, and Apple has not had to support hardware developers that didn't have access to the full operating-system source code. This makes it hard for Apple to support licensees wishing to change the system design to differentiate their products.

Apple says it is now working with a handful of licensees that will build true Macintosh clones: systems using Apple's ASICs and conforming very closely to Apple's hardware designs, enabling the existing system software to be used with little or no modification. Makers of such systems will be able to change the clock rate or the number of NuBus slots, or add NuBus peripherals on the system board, but opportunities for differentiation are limited. Apple will offer system boards, board designs, and possibly even complete systems for OEM labeling. Users of Apple's board designs will be allowed to purchase Apple's ASICs directly from Apple's suppliers.

Even for clone systems, the support required from Apple is significant, and this has been a limiting factor in the number of licensees the company can handle. Within six months, Apple expects to have the Macintosh clone design better prepared for use by other companies, with engineering and end-user documentation to support licensees. At that point, the company will be prepared to accept more licensees for clone-type designs. Apple says that the first Macintosh clones will be on the market in the second half of 1995.

### Macintosh Meets Prep

The new common hardware platform has its roots in the Prep platform that was announced a year ago by IBM and Motorola (see *071704.PDF*). Apple had little involvement in the development of the standard; at the time it was being developed, Apple was not committed to supporting its operating system on any platform other than its own. The resulting specification—which was driven mostly by IBM—therefore was not designed to provide all the features, such as the Apple Desktop Bus

(ADB) and a Macintosh-compatible memory map, that Apple deems necessary for Macintosh systems.

Once Apple became serious about open licensing of Mac OS, it needed a hardware platform definition. Microsoft could base its software on the de facto IBM-compatible PC standard, but Apple needed to create a standard platform definition for Macintosh systems. This made making the Mac OS run on the reference platform a clear priority. Negotiations among Apple, IBM, and Motorola have been under way for months, culminating in the November 7 announcement that an agreement had been reached on the CHRP.

### Enhancing the Prep Specification

Like the original Prep standard, the CHRP is based on the PCI bus—which, ironically, was developed by Intel to advance the standard for x86-based PCs. Apple plans to introduce PCI-based Macs in mid-1995, well before systems based on the CHRP are available. Apple's PCI Macs and the CHRP systems will use Open Firmware, a derivative of the Open Boot architecture developed by Sun Microsystems. Open Firmware drivers, stored in ROM on add-in cards, are written in a dialect of the Forth programming language. This design makes the PCI cards processor-independent and provides an OS-independent mechanism for loading drivers. The boot ROM on the system board includes a small Forth interpreter and the code to load the drivers from add-in ROMs and the OS from disk.

The common platform will support low-level hardware registers from both the PC and Mac environments to simplify the task of providing compatibility with existing software. It also provides I/O functions for both environments. For example, it includes both a PC-type keyboard interface and Apple's ADB port, which is used in Mac systems to connect the keyboard and pointing device, as well as both PC- and Mac-style serial ports.

To support the dual feature sets without increasing the chip count, new peripheral and system-logic chips will be developed specifically for the new platform, combining designs from Apple, IBM, and Motorola. The need to develop these ASICs is part of the reason for the long lead time before systems based on the new specification will be available.

The dual I/O structure will add minimal cost, compared with either PC or Mac systems. Systems based on the common platform will require more connectors than today's PCs, but this amounts to only a few dollars—much less than the cost savings of using a PowerPC processor instead of an x86 processor. Apple and IBM claim that the system logic will not be significantly more



Figure 1. The Mac OS logo, introduced in September, will be used to identify Mac application programs as well as Mac-compatible systems.

## PowerPC Backers Show New Software, Faster Chips at Comdex

Following last year's all-flash-but-no-substance debut at Comdex, the PowerPC camp had quite a bit to show at this year's event. The three partners each had their own booths on the main show floor and also collaborated on the PowerPC pavilion—a big tent in the parking lot—full of PowerPC systems running native applications on Power Macs, on IBM's AIX systems, and on various Prep systems running a beta version of Windows NT. Notable among the applications shown were Microsoft's Word, Excel, and SQL server, as well as WordPerfect, all running native under Windows NT. Very limited demos of OS/2 for PowerPC were also shown.

Several 604-based machines were shown. Most were running at 100 MHz—the fastest announced speed—but a few were running at 120 or 132 MHz. Apple showed a prototype 603-based PowerBook, but despite anticipatory press reports, nothing was said about the rumored 603+.

Apple showed off its recently announced 110-MHz, 601-based Power Mac 8100. In the IBM booth, this machine was used to show application performance of about twice that of a 100-MHz Pentium system on some integer functions such as a search-and-replace in a large FrameMaker document. Unfortunately, at \$6,379 and up, the Power Mac 8100/110 is also about twice the price of a high-end Pentium system. IBM and Motorola have not announced a 110-MHz 601 but are expected to add a 120-MHz version

to the price list in the near future.

Motorola announced that it has licensed the Windows NT suite from Microsoft and will bundle it with its PowerStack systems. The company also added a 604-based desktop system to the product line, delivering performance of 140 SPECint92 and 145 SPECfp92 (estimated and without the optional L2 cache). The Prep-compliant, PCI-based DT604-100 is priced at \$4,295 with Windows NT, 8M of RAM, and a 1G disk, but with no display or keyboard, making it too expensive for the PC market but reasonable as a low-end workstation.

IBM showed new Prep-compliant reference designs, based on the 603 and 604. The designs are available without charge to qualified system makers, and IBM will provide prototype boards for approximately \$2,500.

Members of the Taiwan New PC Consortium, including DTK Computer and Taiwan Power Computer, showed PowerPC systems using 601, 603, and 604 processors. U.S.-based startups FirePower and Power Computing also showed Prep-compliant systems.

Absent from the show were any systems based on the PowerPC 620. IBM declined to comment on the much-rumored PowerPC 615. The PowerPC camp's focus for Comdex was to show that progress is being made, both with system designs and with application and OS ports, and in that they were quite successful.

expensive than PC system logic because the dual I/O structure will be supported by custom chips that combine both sets of functions. Although these chips will have more gates than needed for a simpler standard, this is unlikely to be a significant cost factor.

The small number of system-logic vendors could result in higher prices for these chips, but these suppliers—presumably IBM and Motorola—have a strong interest in promoting PowerPC and thus are likely to accept thin margins on the system-logic chips.

Apple, IBM, and Motorola claim that there are no patent licensing issues for systems based on the CHRP beyond those that apply to any PC. The companies are considering forming a patent pool to provide easy, low-cost licensing of all the required patents. Some observers believe there may be significant issues still to be resolved with regard to intellectual property licensing.

### Freeing the ROMs

The new design includes a SIMM socket for the Apple ROM, which is required to support the existing Macintosh software architecture. This ROM, which is 4 Mbytes in current Power Macs, includes the traditional Apple ToolBox and the 68000 emulator.

Apple could use the need for the Apple ROM to keep a tight lid on the number of companies that could build

systems capable of running Mac OS, but Apple's director of licensing, Don Strickland, says the ROM will not be used to restrict use of the operating system. In the past, the need for an Apple ROM on the system board has been the key barrier preventing unauthorized Mac clones from being practical.

Initially, system makers that license Mac OS will include the ROM in their systems. Systems built by companies without licenses won't include the ROM, but Apple plans to license other companies to offer the ROM as a third-party upgrade. Eventually, Apple plans to eliminate the need for a Mac ROM, moving everything except the boot loader onto the disk—just like all the other operating systems that will run on the platform.

The Mac OS will not be ported to the existing Prep platform. This is a source of great frustration to some early makers of Prep systems, such as FirePower Systems. From FirePower's perspective, porting Mac OS to its current platform is very appealing, but Apple clearly has no interest in this. Mac OS licensing apparently will be fully open once CHRP systems are available, but for now Apple is still being selective, and FirePower hasn't had any success in getting Apple's support.

Prep systems will run all other PowerPC operating systems but will not be able to run Mac OS directly. (It is possible that an upgrade card could enable Prep systems

to run MacOS.) The new CHRP leaves these systems as orphans, to some degree, although CHRP systems will be upward compatible. Users interested only in Windows NT, OS/2, or AIX won't be affected by the transition to the common platform.

### Supporting Windows Applications

With the CHRP, hardware developers will be able to build a single system that can run all significant operating systems—all, that is, except Windows 95. (The ability to run lots of operating systems isn't unique to PowerPC, of course; x86-based systems can run all the same operating systems—except Mac OS and AIX.) With the addition of a dual-mode processor such as IBM's rumored 615, which is expected to offer both x86 and PowerPC compatibility, CHRP systems could run Windows 95 as well.

Without such a processor, Windows 95—or at least applications written for that operating system—could be run using emulation software. Software emulation doesn't offer exciting performance, but with a 1996-era PowerPC processor—perhaps a 150-MHz 604 with bigger caches—and enhanced emulation software, it could be very usable.

The other option for Windows compatibility is to run Windows NT. The current version of Windows NT isn't very attractive for mainstream desktop users, but Cairo—which should be available by the time systems based on the common platform are shipping—will be more appealing because it will include the Windows 95 user interface, as well as an object-oriented file system and software architecture. By 1996, the need for 16M of RAM for Windows NT (or Cairo) will not be as big a hindrance as it is today.

OS/2 for PowerPC remains another option, but IBM's weak position in the OS wars and OS/2's lack of compatibility with 32-bit Windows applications make it unlikely to be a mainstream solution. Eventually, the Taligent operating system could be a major factor in PowerPC systems, but this is too far off to predict its possible relevance.

### Boosting Mac—and PowerPC—Prospects

As the only high-volume OS for PowerPC today, the Mac OS is crucial to the architecture's near-term success. In this regard, the long delay before availability of systems based on the common platform is a serious drawback. This delay may be mitigated, to some degree, by the emergence of Mac clones in the interim.

Apple's Strickland expects that non-Apple systems will increase the Macintosh platform share by about 25%—an additional one million or so systems per year—in the next two to three years. With open licensing of the software, it should be possible to do considerably better than this in three to four years.

By committing to open licensing of its OS, Apple is significantly enhancing the prospects for the Mac platform's growth, and indeed, for its survival. Apple is taking a big chance for its hardware business in opening up the market to competition, but the risk that Mac OS will become a smaller and smaller niche, and lose more and more developer support, is far greater.

It is a shame that it has taken Apple so long to come to this realization, and that it will take so long for the vision to be fulfilled. Had Apple shifted its thinking in 1991, enabling the common platform to be part of the original Apple/IBM/Motorola agreement, it would be in a much stronger position today. Nevertheless, the prospects of growth for the Mac platform in the future may be enough to encourage developers and users to stick with it. The delay reduces the size of Apple's opportunity, since it has enabled Microsoft to increase its dominance, but it is probably not crippling—as long as Apple moves aggressively forward with major enhancements to its system software.

### Apple's Challenge Shifts to Software

The commitment to open licensing is a bold step forward for Apple and significantly improves the company's chances of thriving in the second half of the decade. Apple will become, in essence, two companies: an operating system and applications software supplier, and the largest maker of Macintosh systems. This will be a tricky transition for the company, but it has the potential to make Apple a much stronger player in the long run.

The company's key challenge is to keep a leadership position for its OS. With the emergence of Windows 95, Microsoft will have caught up, in many respects, with Apple's ease of use and even surpassed Apple in offering modern operating-system features such as pre-emptive multitasking and memory protection. Apple won't catch up in its underlying kernel technology until it ships the OS code-named Copland (likely to be officially named Mac OS 8.0). Once planned for mid-95 delivery, the projected date for this OS has slipped into late 1995 or early 1996. Considering the success of Windows 3.1—a product clearly inferior to Mac OS—the prospects for Windows 95 must be truly terrifying to Apple.

If too much time passes between the delivery of Windows 95 and Copland, Apple risks a significant erosion of its customer base. Macintosh users, finding all the key applications available on Windows systems, may be tempted to switch to Windows 95 to join the mainstream and get a more robust OS at the same time.

Apple also must create significant user interface enhancements that make Copland as clearly superior to Windows 95 as the current Mac OS is to Windows 3.1. Whether the company has enough innovative technology to do this—and whether it can be delivered in a timely fashion—remains to be seen. ♦