



# AppleDirections

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## Apple News

### Power Macintosh Computers Are Here!

Starting on March 14, 1994, at more than 100 locations from Istanbul to Anchorage, in front of more than 65,000 customers, Apple Computer, Inc., debuted the first in an anticipated long line of PowerPC processor-based Macintosh computers, the Power Macintosh 8100/80, Power Macintosh 7100/66, and Power Macintosh 6100/60. (The number after the slash contains the processing speed in megahertz, a naming strategy designed to alert customers instantly to the computer's speed.)

Additionally, Apple introduced System 7.1.2, available immediately in localized European and Japanese versions, which will run on the new computers, as well as two options for upgrading existing 68040-based Macintosh computers to PowerPC.

The new systems, which are available in large quantities worldwide, cap Apple's drive to provide industry-best price/performance. The entry-level Power Macintosh 6100/60, with a clock speed of 60 MHz, carries a U.S. Apple price of \$2,209 for base configurations, including color display and keyboard. By comparison, entry level Pentium PC-compatibles currently sell for approximately \$2,500 (U.S. "street price").

## Strategy Mosaic

### The Macintosh Powers Up

#### Power Macintosh Ushers In Apple's New Four-Part Strategy

By Kris Newby

There's something about birthdays that end in 0 that really gets you thinking about where you've been and where you're going. As the Macintosh computer passed the ten-year mark, industry publications filled their pages with time lines, reflections, and report cards analyzing Apple's computer offspring. And what was their verdict? Most think that the Macintosh has done pretty well for a ten-year-old.

The Macintosh computer's most notable achievement is that it's become a catalyst for innovation in the industry. With the zeal of Dennis the Menace, the Macintosh has continually upset technological complacency, forcing established players to adopt innovations such as plug-and-play networking and friendly user interfaces. And just as important, the Macintosh has become the only *real* alternative to the DOS computing platform. (Without the Macintosh computer, we'd still be typing in "xcopy a: c: /e /s" just to copy a folder to another disk.)

But like any ten-year-old, the Macintosh isn't perfect. And as any good parent should,

# AppleDirections

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## Editor's Note

# Growing Pains

On March 14, 1994, Apple Computer, Inc., immutably changed the face of personal computing with the introduction of its first RISC-based Power Macintosh computers. But I want to talk about something else that happened March 14: My son, Henry, celebrated his eighth birthday, an immutable change if I ever saw one.

Having the father that he does, Henry knows something about what Apple did on his birthday; in fact, he thought it would be a great idea if he could get a Power Macintosh for his birthday, typical early technology adopter that he is. (He once played with an early prototype of the Newton MessagePad, and he also thought we should have one of those.) But when I asked him which event that took place on March 14 was most important, I'm sure you can imagine what he said.

Ever since Henry was born, he and I have been extremely close; there are times when I'm sure I know exactly what he's thinking and feeling, and even that's putting it mildly. But every so often, we get completely out of whack with each other. The change will happen overnight, leaving me mystified. Of course, things always got back to "normal," just as suddenly as they fell out of whack, and that mystified me all the more.

One day, it struck me what was going on: Henry is a child, and for him, the passage of time is completely different than it is for me. For grown-ups, a week or even a month is nothing; we've seen hundreds of them go by, and compared to the many years we've lived, they're but a blip.

For any child, though, a few weeks can be a whole lifetime. A month really is a lot of time when you've only lived 40 or 50 of them. And, on top of that, with each tick of the clock the world can appear different because of what's happening to them: new thoughts, new feelings, new shoe sizes, new teeth happen almost every day. In other words, they're growing up.

I think we all have a close relationship with another growing child—the personal

computer. You design an application, it works great, it's going great guns in the marketplace, you're featured in *MacWEEK*, you buy that Porsche. Six months later, sales drop, people think your application is now a dog, and you turn your 911 back in for the old Toyota Corolla. And all because somebody came out with the new XYZ interface that does what your software does, only twice as fast, and shipped it for free with their word processor.

Pretty mystifying, but the fact is that six months is a long time for an industry that got its start less than two decades ago, especially one like ours. And it's easy for all the change, all the growth to completely pass us, and our business planning, by. Staying abreast of the computer industry is like raising a child: You've got to use all your wits to anticipate the next change and know the right way to respond.

We hope we've been giving you enough warning about Apple's introduction of PowerPC technology, so that you wouldn't have to get completely out of whack with us. If not, you've still got time (maybe a little) to catch up and take your applications native. Remember, the release of the first Power Macintosh computers is only the beginning, and you'll keep reading about PowerPC in *Apple Directions* for quite some time.

Also, we're going to start telling you a lot about another new technology: OpenDoc, Apple's open cross-platform compound document architecture. As with PowerPC, if you don't alter your applications to work with OpenDoc, your competition just may overtake you.

Actually, in a way, you Macintosh developers have it easy, at least in comparison to parents. I'll put it this way: I sure wish someone could publish a *Henry Directions* just for me.

Paul Dreyfus  
Editor

IndustryWatch: News & Perspective

# The Sound of Drums

By Amanda Hixson, Director of Licensing,  
InfoWorld Publishing Company

"There will be a chip war in 1994. There's no doubt about it. All the troops are lining up." So said Curt Rohrman, an analyst for CS First Boston, Inc., in the *Wall Street Journal* after IBM announced that it wouldn't manufacture Intel's Pentium microprocessor.

This says to me that IBM is going to be betting big time on the PowerPC architecture. Since IBM doesn't have to retool existing manufacturing facilities, or build new ones, to produce the more complex Pentium processor, it opens the way for them to produce more PowerPC chips—and, potentially, to lower their cost—as demand grows.

This move could prove beneficial to Apple Computer, Inc., as customer demand for the Power Macintosh computer increases, meaning that Apple will have to purchase PowerPC chips in greater quantity from IBM. It will also allow the three members of the PowerPC troika, IBM, Motorola, and Apple, to sell additional chips at potentially lower prices to third-party manufacturers who might be licensees of any of the troika's software technology.

IBM's decision is also important because it puts the burden on Intel to provide the more costly Pentium chips, which, with barely a 1 percent share according to the *Wall Street Journal* article, have yet to create much demand. The timing of IBM's announcement was also appropriate because a price war is already developing around DEC's Alpha (which isn't selling great guns either), Silicon Graphics's MIPS chip, the troika's PowerPC offerings, and Intel's Pentium.

IBM's announcement seems to have accelerated the skirmish and forced Intel to further reduce the price of Pentium chips to keep current Intel 40486 chip users, and potential PowerPC buyers, aligned with Intel. For most of you and your customers, all of these maneuverings should result in lower cost PowerPC processor-based computers, sooner rather than later.

In the days of 50 percent-plus gross margins, this kind of news would shake Apple to its core. Today, Apple has poised itself to succeed in a low-margin world and deliver top performance at competitive prices. Ian Diery, executive vice president and general manager of

Apple's Personal Computer Division, recently said in an interview with Dow Jones & Co, "I welcome the pricing wars." He also said that, since PowerPC chips are less expensive to make than Pentium, Apple has ample room to drop prices on its Power Macintosh computers.

## Contrary to Rumor, Dealers Aren't Dead

According to a recent quote in the *Wall Street Journal* by Liz Buyer, an analyst at T. Rowe Price in Baltimore, "there's a large corporate [computer] market and a large home [computer] market and they shop in different places," which probably seems pretty obvious. But what it means to dealers, and you, might not be.

For the past ten years there has been an ongoing debate about whether computer dealers would be able to compete as traditional dealer sales are eroded by newer, seemingly cutthroat distribution channels, such as mail order, direct mail, and, of late, computer superstores and even shop-at-home television programs. No matter how often the industry predicts dealer extinction, however, the one big dinosaur-destroying meteorite never seems to strike. Instead, Darwinian theory is repeatedly validated as dealers adjust to the times.

As a case in point, the previously mentioned *Journal* article points out that some dealers have fallen by the wayside. More adaptive companies, such as market-leader Intelligent Electronics, Inc., based in Exton, Pennsylvania, and MicroAge, Inc., of Tempe, Arizona, are reacting positively to changes in the environment. This has resulted in a doubling of net income over the past year for Intelligent and a quintupling of net income for MicroAge, according to the *Journal*.

What this means to you is that even though the dealer channel has eroded somewhat, it still offers a prime flow of products into corporations. According to International Data Corporation (IDC) numbers quoted in the *Journal*, last year's personal computer sales broke out in the following manner:

Dealers .....	44%
Retailers* .....	19%
Mail order .....	17%
Value-added resellers .....	15%
Other .....	5%

\*includes superstores, mass merchants and consumer electronics outlets

IDC expects the dealer percentage to drop from 44 percent to 36 percent by 1997, but that isn't as large a dip as many predicted even a year ago.

Part of the reason the decline is smaller than anticipated is that dealers are simply closing their storefronts and going directly to corporations, so don't ignore this channel as an ongoing opportunity for distribution.

## But What About the Home Market?

As I just mentioned, Liz Buyer pointed out that there are at least two parts to the market equation. In addition to business markets, where

## Apple Directions On Line—May

The May issue of *Apple Directions* will be available on AppleLink as follows:

April 1—Preliminary draft copy

April 15—Final copy

To view the May issue of *Apple Directions* on line, follow the AppleLink path Developer Support:Developer Services: Periodicals:Apple Directions:Apple Directions May 1994.

the dealer channel still appears viable, there are still quite a few people who use computers at home (although, as I've said in previous columns, not nearly as many as we'd all like). How, then, will we reach them?

According to an item on Business Wire Features from a new futures-oriented consulting firm called, coincidentally, The Futures Group, based in Glastonbury, Connecticut, the American household is the new champion in the computer products industry.

What I learned from this article is that a growing number of technologies are coming together at this time to empower people at home to make highly informed, selective buying decisions. This decision-making process will eventually encompass many different product areas, including software and hardware, in ways beyond those currently available.

"Because this product selection will be made at home, the impact of media, package design, and shelf space enjoyed by so-called megabrands will diminish significantly," according to Cornelia Hanbury of The Futures Group.

To me this means that developers of all types of products, including hardware and software, will need to rethink the presentation of their products through the different media from which consumers will make their selections. Just as important, your company will need to think of ways to allow individual differentiation and customization on a customer-by-customer basis. In the future, it probably won't do to try to sell your products in a tightly limited number of ways. What works in print won't work on networks, and what works on networks or on-line services might not work in the world of interactive television. And, of course, what works in traditional television probably won't work in the land of 500 channels.

As The Futures Group believes, "the 'brand winners' of the year 2000 will be those that take the time to first learn what technologies are available, and then understand which ones can most benefit their particular companies." And, according to Hanbury, "those [companies] that use technology for its own sake will be just as vulnerable as those

who fail to utilize the new tools available to them." This isn't earthshaking news, but it does smack of good, common sense.

### Interactive Advertising

If it's true that we'll need to rethink how we approach packaging, design, and sales in the future, how will we know what will work and what won't in advertisements? A recent piece I pulled off the Business Wire gives a clue about how one group is going about finding out.

Dallas-based IT Network is currently running a test of its Interactive Channel in Denton, Texas, located near Dallas. In the 150-home test, the Interactive Channel delivers interactive television programming (photographic images with sound, and so on) through existing coaxial cable television and telephone networks. To test the consumer response to interactive television advertising concepts, the New York-based advertising firm of Bozell, Jacobs, Kenyon & Eckhardt is participating in this test. As a participant, Bozell hopes to be able to provide its clients with real-time usage and survey feedback from trial participants.

Although this test is a small step on the information highway, it is significant because IT Network is a consumer information service that runs on interactive telephone networks in 44 U.S. cities. IT's effort will help us understand what works over standard telephone lines. This effort is critical to our success reaching customers through on-line services and the Internet, especially for distribution. Bozell's work is important because advertisers and marketing firms must understand the new technologies that we'll need to use when packaging and delivering our products electronically in the future. ♣

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*Amanda Hixson, long-time Apple veteran, high-tech journalist, and industry analyst, is currently director of licensing for InfoWorld magazine. There, she's responsible for discovering new forms of electronic distribution for the magazine's content. Don't worry, she isn't responsible for creating the content, simply making sure that all of you have on-line access to it. She can be reached at A.HIXSON on AppleLink.*

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## Strategy Mosaic

### The Macintosh Powers Up

*continued from page 1*

Apple Computer, Inc., is continually reevaluating the current industry situation and recalibrating its "child's" development strategy. The result of this analysis is a new four-part Macintosh development strategy. You're probably quite familiar with the first part of the new strategy—the Power Macintosh. The other parts focus on advancing the software side of the Macintosh platform in three areas: component

software, collaboration, and active-assistance interfaces.

How will this strategy affect you? First, it should significantly increase the number of Macintosh computer users, so you'll be able to sell more products with less effort. Second, system software advances should make it easier for you to develop innovative new software and hardware solutions. The rest of this article describes this strategy in detail, and explains how it will help you and your customers.

#### Apple's Four-Part Strategy

In mid-February, Apple began a series of briefings explaining its new development strategy to industry press, analysts, and key

customers. The essence of this strategy consists of moving the Macintosh platform in the following four directions. (For a summary, see "Industry Trends and Apple's New Strategy" on page 5.)

- *From a CISC to RISC hardware architecture.* RISC-based Power Macintosh computers will provide developers with the high performance needed to make new software technologies—for example, speech recognition and full-motion video—available to mainstream users at affordable prices. An important part of this transition is Apple's upgrade strategy that enables many 680x0 Macintosh users to move to Power Macintosh computers.

- *From a monolithic to component software architecture.* The OpenDoc software architecture will allow users to combine multivendor, modular application "parts" into customized documents, helping them become more productive. (For more information on OpenDoc, see "Why 1994 Will Be Like 1984" in the August 1994 issue of *Apple Directions*.) This open standard is being jointly developed by Apple and IBM, Novell, WordPerfect, and other industry partners.

- *From generic communication to productivity-enhancing collaboration.* As the pace and volume of communication in the workplace picks up, it becomes more important for computing

solutions to help teams of people to work better together. Apple technologies like Open Transport (a platform-independent communications architecture), Apple-Search (an agent technology that simplifies information retrieval in client/server environments), and AOCE collaboration services such as PowerTalk and PowerShare Collaboration Servers (individual and server-based collaboration services) will enable users to

work together and manage information across mixed-platform environments more effectively.

- *From a passive to an active-assistance user interface.* The key to making people more productive in the 1990s will be to develop interfaces that provide active assistance to users. Apple software technologies such as AppleScript (for creating intelligent agents), OpenDoc (for developing user-customizable,

object-based applications), and PlainTalk (for enabling speech recognition) will allow Apple and developers to create interfaces that adapt to individual users' needs and help them work more efficiently. Apple Guide is another software technology that will make it easier for customers to use Macintosh computers. This set of interactive, context-sensitive functions will help users learn new or complex tasks with a

series of on-screen prompts. Functions can also be customized to lead users through tasks that are unique to a particular company or organization. (Apple Guide will ship with the next reference release of Macintosh system software, due sometime during the first half of 1994.)

There's one overall message that we hope you take away from this strategy: Apple is making dramatic changes on both the hardware and software side of the Macintosh platform to give the platform room to grow. Think of the 680x0-based Macintosh as those 501 jeans you wore throughout school. They're getting a wee bit too tight, and though they're your sentimental favorites, it's probably time you switched to some power-packed "loose-fit" 601s. (To learn more about the benefits of the PowerPC 601 processor, see "PowerPC Processors—What's New" on page 33.)

**An Industry Snapshot: Less Profit, More Competition**

As painful as these major technology transitions may be in the interim, they're vital to the ultimate success of the Macintosh platform. Falling prices, channel competition, and industry consolidation are making it increasingly difficult for software and hardware companies to make healthy profits. And this means existing developers aren't able to invest as much in future R&D, and innovative new startup companies aren't as likely to survive. In the most recent shareholder's meeting, Apple President Michael Spindler discussed some of these challenging market trends.

- *Falling prices.* As you well know, hardware and software prices have plunged in the last two years. For example, in 1992, the price of a mid-range PC clone with an 80486 Intel microprocessor and the Microsoft Windows

## Industry Trends and Apple's New Strategy

Technology areas	State-of-the-industry technology	Future directions	Apple solutions
Microprocessor	CISC	RISC	RISC-based Power Macintosh computers will provide the high performance needed to make advanced software technologies available to mainstream users at affordable prices.
Application	Monolithic software	Component software	The OpenDoc software architecture will enable users to combine multi-vendor, modular application "parts" into customized documents, helping them become more productive. This open standard is being jointly developed by Apple and other industry partners.
Networking	Communication	Collaboration	Apple's Open Transport platform-independent communications architecture and AOCE collaborative services like PowerTalk and PowerShare Collaboration Servers will enable users to work together and manage information more effectively across mixed-platform environments.
User interface	Passive user interface	Active assistance	Software technologies such as AppleScript, OpenDoc, and PlainTalk speech recognition and synthesis will allow Apple and developers to create intelligent interfaces that help individuals work more efficiently. Also, Apple Guide's interactive, context-sensitive help functions will make it easier for customers to use Macintosh computers.

operating system was \$4,100. Eighteen months later, at the end of 1993, the price of that same personal computer was about \$2,900.

In the Macintosh market, the drop has been even more dramatic. Twelve months ago, a mid-range Macintosh with a 68040 microprocessor sold for about \$4,500. Today that same level of performance sells for about \$1,900. This drop in price far exceeds the reduction in product costs over the same period—market pressures have forced manufacturers to live with lower profits. Similar changes have occurred in the software market, where competition and bundling have forced profits down.

- **Channel competition.** With profits lower on each computer and software package sold, the drive to sell more computers to make up the difference has led to significant competition in the channel. Selling products in all channels, including mass-market superstores, is a necessary part of competing today. In this type of environment, forming partnerships and marketing your products appropriately with name brands like PowerBook or Performa is crucial.

- **Industry consolidation.** The fundamental importance of volume and scale across channels has forced many smaller companies out of business. According to International Data Corp. (IDC), the market share of the top ten personal computer manufacturers grew from 44 to 50 percent in 1993. And similarly in the software business, about 95 percent of the revenues flow into just twenty software companies. (Need we name names?) It's hard for the small, innovative developers to compete with these companies' in-house resources and investments in code. This strangulation of healthy free-market competition is bad for users and the industry.

As you'd guess, Apple is already tackling these challenges on numerous fronts. (For example, this year Apple sacrificed short-term profits on CD-ROM drives in order to establish Macintosh as the premier platform for CD titles. This strategy has been extremely successful—during the quarter that began October 1993, Apple sold one CD-ROM drive for every three Macintosh computers.) Apple's four-part strategy aims to focus internal development and third-party developers around a common set of goals, so Apple can make these transitions as quickly as possible. Apple expects these transitions to

- significantly expand the Macintosh market
- establish Macintosh as *the* platform for open innovation
- provide Macintosh users with what is hands-down, the best user experience

Details on how Apple hopes to achieve these goals follow.

### Expanding the Macintosh Market

Increasing the Macintosh installed base will make you more profitable, because of the economies of scale. That is, you'll make more profits because you'll spend the same amount on development as you do now, but you'll be able to reach more potential customers. Apple hopes to fuel this growth as follows.

- **Aggressive pricing.** Last year Apple lowered prices and profit margins to make the Macintosh computer more competitive with other industry PCs and gain market share. The result? Unit shipments increased 32 percent for the year, a 40 percent increase compared to the same quarter a year ago.

- **Moving to RISC.** Over time, the adoption of RISC technology will enable Apple to provide customers with systems that offer

*more value for the money* than those of competitors. This shift should win over not only new computer purchasers, but also converts from other platforms. (See the article "Power Macintosh Market Outlook" on page 29 for detailed estimates and analysis of how the adoption of RISC technology will cause the Macintosh installed base to expand dramatically.)

- **Creating new distribution channels.** Apple is working to create new distribution channels, which you will also benefit from. For example, when Apple is selling systems through Wal-Mart and Sears, it should be easier for you to get shelf space in these mass-market chains. In addition, new Apple business areas such as Newton and eWorld on-line services should provide you with new product and service opportunities.

### Establishing an Open Platform for Innovation

Michael Spindler created a stir at the recent shareholders' meeting by announcing that "The combination of PowerPC and the Macintosh operating system gives Apple the possibility of building a new industry platform, by allowing us to license Apple software to other PowerPC makers. We are actively exploring this route."

"But why," you may ask, "is Apple making such a departure in its tradition of keeping its operating system and technologies proprietary?" Michael Mace, Apple's internal competitive analysis expert, sums it up best: "What we learned from the first ten years of Macintosh is that you can't completely change the world without setting standards, and you can't set standards without partners. We're going to try to make Power Macintosh the next computing standard by sharing it. It's a strategy to increase our market share and open up the platform so lots of people can innovate. Apple will continue to

make computers, but customers will have more choice, and the competition between Macintosh licensees will keep prices low and push innovation along rapidly."

Apple calls this new approach "fitting in and standing out" and here's what it entails:

- **Fitting in with standards.** By committing to RISC as the main processor platform, it'll be easy for DOS, Windows, and current Macintosh users to migrate over to the Power Macintosh platform. Power Macintosh users will be able to run most Windows and MS-DOS programs through Insignia Solutions' SoftWindows emulation software, which is shipping with selected configurations. And users of the UNIX® operating system will benefit from PowerPC technology through Apple's joint efforts with IBM to develop AIX on PowerPC. In addition, Apple will continue to make the Macintosh work with other computers on networks, in enterprise environments, and in peer-to-peer environments.

- **Moving to the OpenDoc software architecture.** As software becomes more powerful and feature-rich, it also becomes more difficult to use and keep updated. From a developer's perspective, large applications are so costly to develop and maintain, only a few developers can afford to produce them. And with a full-sized application taking over two years to revise, it doesn't leave much time for you to work on innovative new applications. What results are fewer opportunities for you and a narrower range of software choices for customers.

OpenDoc will enable you to offer to your customers smaller applications—called *parts*—that work together transparently and across multiple platforms. You'll be able to concentrate on innovation rather than on maintaining a large code base and managing multiple-platform development teams.

• *Standing out with innovation.* Apple has built its reputation as a technology innovator, creating products and technologies that make computers easier to use for mainstream customers. One example of how Apple intends to extend its leadership in collaboration solutions is by building on its OpenDoc and Open Transport architectures. OpenDoc will allow Apple parts to be used across networks, which means a single software solution could be used by everyone in a workgroup—even if they're on different hardware platforms. With Open Transport, you'll be able to write a single application that automatically supports all major networking protocols. And your users will be able to freely select the applications or parts they want, without worrying about network protocols.

Apple innovations will continue to “stand out” in other areas with immediately usable implementations of RISC, component software, collaboration technologies, and active assistance. By offering superior solutions in these four key areas and a smooth migration path for users on other major platforms, Apple will provide an open industry-standard platform that brings users immediate rewards and long-term protection of their computing investments.

### Creating the Best User Experience

Apple's talent has always been its ability to look at the potential of new technology from a user's point of view, then utilize it in computers that help people become more productive. By leveraging the performance of the PowerPC processor, OpenDoc,

collaboration technologies, speech recognition and synthesis, and many other upcoming system software technologies, Apple and developers will be able to go beyond point-and-click interfaces. Users will be empowered to create customized applications made of modular parts that are perfect for their unique needs. Cross-platform issues will become more invisible to users. And workflow solutions will automate many tedious tasks. Bottom line, creating the best user experience in the industry will garner Apple and you extra sales: It'll break down the sales resistance of the computer-phobic and win over users from other platforms.

### Looking Forward to the Next Ten Years

In addition to the Macintosh turning ten, Apple is also

celebrating another milestone—the ten-year anniversary of our relationship with Macintosh developers. Coincidentally, this anniversary coincides with the unveiling of one of the most significant developments in the history of Apple—the introduction of the Power Macintosh computer and a new system software strategy. Looking forward to the next ten years, we hope this new platform provides you with the horsepower you'll need to fuel the next software revolution, and we hope it will be even more breathtaking than the one you've created thus far. ♣

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## Apple News

### Power Macintosh Computers

*continued from page 1*

Apple positions the new systems as the foundation for the future of personal computing, and many agree. In the words of one of the first Power Macintosh customers, the computers represent “more than simply an incremental change. They up the ante, because they shift the personal computer paradigm with PowerPC RISC technology.”

They are the first and, so far, the only RISC (reduced instruction set computing) systems to work with a mainstream personal computing operating system, Macintosh System 7. The new systems also offer a smooth migration path for current Macintosh and IBM PC-compatible users and are expected to attract

many current DOS/Windows customers, since Power Macintosh computers will run, as is, most available Macintosh and Windows applications.

### What This Means to You

This month, *Apple Directions* fleshes out the messages you have heard so far so you can understand how the new computers will affect your business. You can read about how the new computers fit into Apple's overall strategy in this month's Strategy Mosaic (on page 1).

If you're interested in the technical differences the new Power Macintosh architecture poses your programmers, see page 19 for the first part of Gregg Williams's “Understanding the Power Macintosh Architecture.”

For hardware technical details, you should refer to this month's Developer CD; there you'll find *Macintosh Developer Note #8*, which describes Power Macintosh computer hardware.

Finally, for an exploration of the impact Power Macintosh computers are expected to have on the global personal computing market, including Apple's marketing plans for the systems and the numerical projections of a leading analyst, you'll want to read “Power Macintosh Market Outlook,” which makes up the entire Business & Marketing section this month, starting on page 29.

The rest of this story will fill you in on Power Macintosh news, telling you what Apple and a host of others announced March 14 and what that means to you as well as providing details about the new products. (If you can't wait to read specifications for the new computers, you'll want to jump to the fact sheets on pages 12–13.)

### DOS/Windows Switchers

First, something that I hope will get you excited about PowerPC, if you aren't already: some initial, very positive feedback from customers who looked at prerelease

versions of the RISC systems. And these aren't just any customers. They're decision makers from major corporate accounts who are responsible for outfitting their companies with Macintosh computers or DOS/Windows machines. Here's what some of them had to say:

*There is a big “Wow!” factor when people in my company see the Power Macintosh systems, even for DOS and Windows bigots.*

*We're seriously considering not buying any more PCs until Power Macintosh computers come out, and then buying Power Macintosh instead.*

*It's easier to install Windows on Power Macintosh computers running SoftWindows than it is to install Windows on a PC.*

*In my company, our human resources group put on hold an order for 700 Pentium machines*

*when we saw the Power Macintosh computer running SoftWindows.*

*Former PC bigots in my company who didn't even want our Macs on their network are now coming to inquire about this PowerPC thing going on.*

It's clear that the existing Macintosh installed base can't wait for Macintosh with PowerPC, but Apple's claims that the new RISC systems will attract "DOS/Windows switchers" in droves to the Macintosh platform are easier to question. These customer quotes, and many others like them, suggest that Power Macintosh computers *will* pose an immediate challenge to Windows machines in the marketplace and put the Macintosh operating system on the desktops of many new customers for your products.

### A Significant Juncture

At a level that really counts—that is, the ability to make money with Macintosh products—the new computers mark a significant juncture, for Apple and for you. By being first to market with RISC-based personal computers, Apple has created a significant opportunity to greatly expand its sales and significantly broaden the market for your products. As the above quotes indicate, much of that market will come from

previous DOS and Windows users.

Ian Diery, executive vice president and general manager of Apple's Personal Computer Division, recently said that within three to five years, Apple intends to increase its share of the personal computer market by more than 5 percentage points as a result of Macintosh with PowerPC.

The best news for you is that it's not going to take huge amounts of work to ride this new wave. Despite new hardware and software features, Apple's engineers have worked hard to be sure the the latest Macintosh computers are still Macintosh computers. The user experience remains the same, and you don't have to do a thing for your products to work with Power Macintosh computers. Virtually all existing Macintosh applications will run, as is, in emulator mode on Power Macintosh computers at 68040 speeds.

Further, Power Macintosh computers can also run MS-DOS and Windows applications at 80386 to 80486 performance levels when using Insignia's SoftWindows, emulation software based on Microsoft Windows, the source code for which Insignia has licensed from Microsoft. SoftWindows, available from computer dealers as a separate product, is bundled with special configurations of the new computers.

Of course, for your applications to take advantage of the Power Macintosh two- to six-times performance enhancement over 68040-based Macintosh computers, they will have to be ported to run in "native" PowerPC mode. However, once you get started porting, Apple is sure you'll find that it's easier to "go native" than you might have anticipated.

Apple expects PowerPC microprocessors to pervade the entire line of Macintosh computers and servers within the next several years. Ian Diery said that Apple plans to convert 40 percent of Macintosh shipments over to PowerPC technology by the end of this year. Three to four years from now, all Macintosh computers shipped by Apple will use PowerPC chips, says Diery. You want to be sure that your products take advantage of the power and features of the next-generation computers.

### Purchasing Your Power Macintosh Systems

Many of you have asked us, "How do I do that if I can't even get a Macintosh with PowerPC system?" Now, in addition to being able to purchase the Macintosh with RISC Software Development Kit through APDA (see page 36 for APDA ordering information), you can also buy your own Power Macintosh computers to test PowerPC applications.

If you're an Apple Partner or Associate, a limited number of systems are available for you to purchase through the hardware purchase program. We've been told, however, that you're likely to get your hands on Power Macintosh computers much more quickly by going to a local dealer and buying them there. Or you may want to opt for upgrading one of your current systems with one of Apple's two PowerPC upgrade solutions (more on that in the section "Upgrading 680x0 Macintosh Computers to PowerPC.")

Whichever option you choose, it's probably worth the savings in time to spend a little more to get your PowerPC system. You'll want to strike with Power Macintosh products while the iron is hot, and the iron is hot: Worldwide, Apple expects to ship 1 million of the new systems in the first year, and you'll want your native products to be ready for this vast group of customers.

### Apple and You

One of the reasons Apple expects immediate, big sales of the PowerPC processor-based computers is that so many of you have already readied native PowerPC applications to ship simultaneously with the new computers. For a list of the first native Power Macintosh software products to hit the market, see "Power Macintosh Software" on page 11.

At the main introduction venue in New York City, developers demonstrated nearly 40 products running in native mode. Within 30 days of Apple shipping the first Power Macintosh computers, as many as 80 native PowerPC applications will be available worldwide. By June, at least twice that many are expected to be available, and within a year after the first Power Macintosh, Apple expects nearly 1,000 native applications to be available to customers.

Apple is strongly supporting your efforts to develop and market native PowerPC applications. In addition to providing you native development tools (such as the Macintosh on RISC SDK) in advance of shipping the first Power Macintosh computers, Apple is partnering with you to market applications that run in native mode on the new systems.

For example, this winter Apple has been conducting an extensive PowerPC marketing and advertising campaign. The latest in a series of ads called "The Apple Report on PowerPC" is subtitled

## PowerPC 601 vs. Pentium

This chart shows that Pentium chips are larger, have a smaller memory cache, require more power, and are more expensive than PowerPC 601 chips. Data is current as of December 1993.

	PowerPC 601	Pentium
Die size	120 mm	264 mm
Cache	32K	16K
Power	8.5 W	16 W
Price	\$450	\$850



“Applications Accelerated for PowerPC” and features 20 native applications. Designed to reach 17 million readers in the United States, the ad series is appearing not just in the traditional Macintosh trade publications, such as *MacWEEK* and *Macworld*, but also in magazines and tabloids typically read by users of IBM PC-compatible machines, such as *PC Week* and *InfoWorld*.

Soon, Apple will also place ads in publications for specific vertical markets—publishing, technical users, and higher education—touting the performance of the Power Macintosh computers and native software solutions, as well. Apple is targeting those three vertical markets because it expects the RISC systems to be especially appealing to customers within them.

Additionally, Apple is publishing the *Power Macintosh Software Directory*, which will be available everywhere that Power Macintosh computers are sold. It includes a list of applications that have been converted to run in native mode on the PowerPC processor-based systems. Further, in every Power Macintosh computer box Apple is including a demo CD-ROM with native PowerPC applications. Until now, opportunities to participate in these comarketing programs have been limited, but Apple intends to expand them soon. In future issues of *Apple Directions*, we'll let you know how you can participate; also, watch your AppleLink mailbox for information, especially if you're a member of Apple's Partners and Associates programs.

**Competitive Price/ Performance, and Then Some**

The main appeal of the RISC Macintosh systems will be their competitive price and performance. In that way, they're just like any other Macintosh computer, only more so, in a big way. We've already told you about the Power Macintosh 6100/60. The top-of-the-line Power Macintosh 8100/80 runs at a phenomenal 80 MHz, and its base configuration retails with color display and keyboard for \$4869 (U.S. Apple Price), while the 7100/66, with a clock speed of 66 MHz, starts at a U.S. Apple Price of \$3379 with color display and keyboard. Together, they're quite simply the most powerful Macintosh computers ever made; they're also among the

best performance values in the industry.

What makes this possible is the Power Macintosh computers' RISC microprocessors. RISC chips carry far fewer instructions than do CISC (complex instruction set computing) chips, including both the Motorola 680x0 and Intel 80x86 (including Pentium) chips. With CISC chips, speed is obtained by putting more and more instructions on the microprocessor, making more powerful chips larger, more power-hungry, hotter to run, and more expensive.

RISC chips perform more quickly by building complex instructions—very quickly—out of the basic instruction set already on the chip. This makes RISC chips smaller, cooler, more energy efficient, and less expensive than

## Upgrading Existing Macintosh Computers

Along with its first Power Macintosh computers, Apple is shipping two upgrade solutions for existing Macintosh computers that use the 68040 microprocessor. Apple has also announced it will provide upgrades for Macintosh LC 475, 520, 550, 575, and Macintosh Quadra 605 computers, as well as the Performa 475/76 and 550 computers. Older Macintosh model upgrades are expected to be provided by Apple and other companies.

The following chart shows the upgrade paths for 68040 Macintosh computers. Note that some models can be upgraded with *either* the user-installable Power Macintosh Upgrade Card, which fits into the computer's processor-direct slot, or the dealer-installed Power Macintosh Logic Board Upgrade, while others use *one or the other* of the two solutions.

Current Macintosh model	Current speed (MHz)	Speed with Power Macintosh Upgrade Card (MHz)	With Power Macintosh Logic Board Upgrade upgrades to this Power Macintosh model
Macintosh Quadra 950	33	66	**
Macintosh Quadra 900	25	50	**
Macintosh Quadra 840Av	40	*	8100/80 or 8100/80Av
Macintosh Quadra 800	33	66	8100/80 or 8100/80Av
Macintosh Quadra 700	25	50	**
Macintosh Quadra or Macintosh Centris 660Av	25	*	6100/60 or 6100/60Av
Macintosh Quadra 650	33	66	7100/66 or 7100/66Av
Macintosh Centris 650	25	50	7100/66 or 7100/66Av
Macintosh Quadra 610	25	50	6100/60 or 6100/60Av
Macintosh Centris 610	20	40	6100/60 or 6100/60Av
Macintosh Ilvx	32	*	7100/66 or 7100/66Av
Macintosh Ilvi	16	*	7100/66 or 7100/66Av
Macintosh Performa 600	32	*	7100/66 or 7100/66Av

\* does not take Power Macintosh Upgrade Card

\*\* does not take Power Macintosh Logic Board Upgrade

CISC chips. For more about why RISC chips are inherently more powerful than CISC chips, see "Making the Leap to PowerPC" in Issue 16 of *develop*, the Apple Technical Journal.

The chip that runs the Power Macintosh computers is the PowerPC 601, which is cheaper, smaller, more efficient, and at least as powerful as current Pentium microprocessors. For a thumbnail comparison of the two microprocessors, see the chart "PowerPC 601 vs. Pentium" on page 8.

Future members of the PowerPC microprocessor line, which is being jointly developed by Apple, IBM, and Motorola, are expected to improve on the PowerPC 601 in a variety of ways; some will be cheaper and even more efficient, making them perfect for low-end and portable systems. Others will be vastly more powerful, providing workstation and server chip solutions. (See the chart "PowerPC Processors—What's New" on page 33 for more information about the PowerPC chip family.) On the other hand, there is not as long a growth path for Pentium processors.

Also responsible for the Power Macintosh computers' performance is the floating-point processor and 32K cache that are part of each system. Floating-point calculations are more than ten times faster than those on the fastest 68040-based Macintosh computers. Additionally, the Power Macintosh 8100/80 provides 256K of level-2 cache.

### AV Technologies, Other Features

But performance, although a big part of the story, is only part of the story. Each of the Power Macintosh computers ship standard with two features previously available only with AV Macintosh computers, GeoPort and PlainTalk.

The GeoPort telecommunication architecture integrates sending and receiving of data, fax, and

voice telephony. It makes it possible for users to access voice mail, e-mail, and fax messages from their computers and to use the Macintosh computer as a speaker phone and an answering machine. (For more about GeoPort, see the March 1994 Strategy Mosaic, "A Phone on Your Desktop.") PlainTalk provides two capabilities, speech recognition and text-to-speech, which you can read more about in the October 1993 *Apple Directions* Editor's Note, "Computer, Read My Lips."

Special AV configurations of the Power Macintosh computers provide the other third of the AV technologies, video in and video out, for use with televisions, video cameras, and video recorders.

In addition, all of the new computers ship with at least 8 MB of memory, expandable to 72 MB on the Power Macintosh 6100/60, 136 MB on the Power Macintosh 7100/66, and 264 MB on the 8100/80. Each ships with an internal hard disk, ranging from 160 MB to 1 GB in size, and all can accommodate a built-in CD-ROM drive. Ethernet is built into each of the computers, and each contains two LocalTalk- and GeoPort-compatible DMA serial ports.

The Power Macintosh 6100/60 supports every Apple display except the 20- and 21-inch sizes, while Power Macintosh 6100/60AV and all Power Macintosh 7100/66 and 8100/80 computers support all Apple displays. For video support, the Power Macintosh 8100/80 includes 2 MB of VRAM, the Power Macintosh 7100/66 includes 1 MB of VRAM (2 MB on AV models), and the Power Macintosh 6100/60AV includes 2 MB of VRAM for second-display support.

For complete product specifications, see the nearby fact sheets.

### System 7 for PowerPC

In creating a new version of System 7 for the PowerPC systems, Apple engineers originally faced a

dilemma: how to deliver in a very short period of time a new version of the operating system that could run in native mode. An emulator to run applications written for 680x0 Macintosh computers already existed, but the engineers wanted to take as much of the operating system native as time allowed.

To deliver an operating system that could take the most advantage possible of PowerPC technology, Apple devised a mixed-mode architecture, part of which uses 680x0 code, part PowerPC code. The engineers, after a great deal of research and testing, ported to PowerPC code those parts of system software that made the biggest improvements to system performance.

Over time, additional parts of the system will be translated to native mode to provide even greater performance. For example, System 7.5, the next major release of Macintosh system software available sometime this summer, will include native versions of PowerTalk and QuickDraw GX.

### Upgrading 680x0 Macintosh Computers to PowerPC

A key part of Apple's Macintosh with PowerPC introduction strategy has been to devise simple, affordable solutions for upgrading existing 680x0-based Macintosh computers to PowerPC. Along with the introduction of Power Macintosh computers came the shipment of the Power Macintosh Upgrade Card and Power Macintosh Logic Board Upgrades for most 68040-based systems.

The Power Macintosh Upgrade Card, which sells for a U.S. Apple Price of \$699, can be installed by customers in the processor-direct slots of their computers. It contains the PowerPC 601 chip with floating-point processor, 32K cache, and 1 MB level-2 cache and delivers performance that is two to four times faster than the origi-

nal 68040-based system for native applications.

The logic board upgrades, which must be installed by authorized Apple resellers, upgrade the 68040 computers to the identical capabilities of one of the Power Macintosh computers. For example, installing a logic board upgrade in the Macintosh Quadra 800 turns it, for all intents and purposes, into a Power Macintosh 8100/80 computer, with all its power and features. Logic board upgrades with Power Macintosh AV features are also available. These upgrades cost from \$999 for the base Power Macintosh 6100/60 configuration to \$1999 for upgrading to Power Macintosh 8100/80AV specifications. The chart "Upgrading Existing Macintosh Computers" on page 9 shows which Macintosh models can use the two upgrade solutions.

In the near future, Apple also plans to provide upgrades for Macintosh LC 475, 520, 550, 575, and Macintosh Quadra 605 computers, as well as the Performa 475/76 and 550 computers. All Apple upgrades will boost performance two to four times on existing Macintosh models when running native applications. Upgrade solutions for many older Macintosh models are expected to be announced soon by Apple and other companies.

### PowerPC Servers and Server Upgrades

Apple has made it clear that these are but the first of many PowerPC processor-based products. It's likely that the next major announcement will consist of details about new PowerPC processor-based Apple servers to follow in the footsteps of Apple's current Workgroup Server family, introduced last March. Apple Business Systems (ABS), the division of Apple responsible for servers and network services, has committed to offering affordable upgrades for

*please turn to page 12*

# Power Macintosh Software

The following is a list, by category, of applications that have been ported to run in native PowerPC mode on the new Power Macintosh computers and that are shipping near the introduction of the new systems. By running in native mode, they can take advantage of the Power Macintosh computers' two- to six-times performance boost over previous 68040-based Macintosh models. These products are the basis for the *Power*

*Macintosh Software Directory*, which will be made available to customers wherever Power Macintosh computers are sold.

*Apple Directions* will let you know how your Power Macintosh products can be considered for future editions of the *Power Macintosh Software Directory*.

## Animation/3-D Rendering

Electric Image Animation System	Electric Image
form•Z	auto•des•sys
Infini-D	Specular International
StudioPro	Strata
Virtus VR	Virtus
Virtus WalkThrough	Virtus
Virtus WalkThrough Pro	Virtus
ZOOM	Graphisoft

## Computer-Aided Design

ArchiCAD	Graphisoft
ITEDO IsoDraw	ITEDO Software
MiniCad	Graphisoft

## Database

4D Server	ACIUS
Microsoft FoxPro	Microsoft

## Design/Illustration

Adobe® Dimensions	Adobe Systems
Adobe Illustrator	Adobe Systems
Adobe Photoshop	Adobe Systems
Aldus Freehand	Aldus
Alias Sketch!	Alias Research
Fractal Design Painter	Fractal Design
Kai's Power Tools	HSC Software
Ray Dream Designer	Ray Dream

## DOS/Windows Compatibility

SoftWindows	Insignia Solutions
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## Entertainment

Harrier Assault	Domark Software
ROUTE 66	ROUTE 66 Geographic Information Systems
Spaceway 2000	Casady & Greene

## Multimedia

Adobe Premiere	Adobe Systems
Cumulus	Canto Software
ImageBase Pro	ORKIS
ImageBox	ORKIS
VideoFusion	VideoFusion

## Networking

LANsurveyor	Neon Software
MacVisa	Hi Resolution
NetMinder Ethernet	Neon Software
TCP/Connect II	InterCon Systems
VICOM MultiTerm Blue	VICOM Technology
VICOM MultiTerm Plus	VICOM Technology
VICOM MultiTerm TCP	VICOM Technology
VICOM MultiTerm VT	VICOM Technology
VICOM Pro	VICOM Technology
VICOM RunTime	VICOM Technology

## Office Productivity

Arrange	Common Knowledge
cc:Mail	Lotus Development
ClarisWorks	Claris
Great Plains Dynamics	Great Plains Software
Microsoft Office	Microsoft
Microsoft Word	Microsoft
Nisus Writer	Nisus Software
PowerSecretary	Articulate Systems
WordPerfect	WordPerfect

## Professional Publishing

Aldus PageMaker	Aldus
ArtPro	Artwork Systems
FrameMaker	Frame Technology

## Spreadsheets/Charting/Presentations

Deltagraph Pro 3	DeltaPoint
Microsoft Excel	Microsoft
Microsoft PowerPoint	Microsoft
Voyant	Brossco Systems

## Technical Analysis

HiQ	National Instruments
Mathematica	Wolfram Research
MultiFrame 3D	Graphic Magic
Ultimage	Graftek

## Utilities

Cirrus	Canto Software
Radius RocketShare	Radius
Retrospect	Dantz Development
Retrospect Remote	Dantz Development

## Power Macintosh Computers

continued from page 10

current Workgroup Server models. Plans are also in the works for new versions of AppleShare, AppleSearch, and Apple Remote Access that take advantage of PowerPC performance enhancements.

PowerPC processor-based Workgroup Servers are expected in the very near future; eventually, Apple expects its Workgroup Servers with PowerPC to run the

forthcoming PowerOpen operating system, Apple's implementation of AIX (a version of UNIX developed by IBM) with the Macintosh interface. ABS expects to make a detailed announcement about Apple's server business in May, and *Apple Directions* will fill you in as soon as possible.

### The Story Remains the Same

Bottom line, what all this means for you is pretty much what it's meant since Apple first unveiled its plans to marry PowerPC RISC

microprocessors with Macintosh computers: Take your application native, the sooner the better, because it takes time to get new applications on the market and you'll want to be there when Power Macintosh sales take off.

Soon, Apple will be asking you to adopt other new technologies and to develop applications that take particular advantage of previously unthinkable capabilities made possible by PowerPC. The spoils of the future software wars will go to those of you who dream up the killer PowerPC applica-

tions of tomorrow—the ones that, by taking advantage of the new power and new features, will do something truly radical.

## Newton News

On March 4, 1994, Apple announced two new models of the Newton MessagePad, an upgrade path for the existing Apple Newton MessagePad, several software products, and a new adopter of Newton technology, Toshiba

# PowerPC Fact Sheet: Selected Power Macintosh Data

## Power Macintosh 6100/60 and Power Macintosh 6100/60Av Computers

### Microprocessor

- PowerPC 601 running at 60 MHz with integrated floating-point unit and 32K cache

### Memory

- 8 MB or 16 MB of RAM, expandable to up to 72 MB

### Disk Drives

- One built-in Apple SuperDrive 1.4 MB floppy disk
- One internal hard disk (160 MB and 250 MB options available)
- Accommodates one 5.25-inch, half-height device, such as the AppleCD 300i Plus CD-ROM drive

### Displays

- All Apple displays except 20-inch and 21-inch
- Most third-party displays as well as NTSC, PAL, VGA, and SVGA monitors

### Video Support

- DRAM display support
- 2 MB of VRAM for second display support (6100/60Av only)

### Interfaces

- One Apple Desktop Bus (ADB) port
- AAUI-15 Ethernet connector
- High-density display port supports Apple AudioVision monitors directly and supports other displays with a Power Macintosh Display Adapter (included with the 6100/60 only)
- Two LocalTalk- and GeoPort-compatible DMA serial (RS-232/RS-422) ports
- High-speed asynchronous SCSI interface connects up to six SCSI external devices
- 16-bit stereo sound input and output ports
- 6100/60 only: Internal expansion slot for processor-direct or 7-inch NuBus™ expansion card (requires adapter)
- 6100/60Av only: DB-15 video port for display support
- 6100/60Av only: s-video input and output ports

### Networking

- Built-in Ethernet
- Two serial ports for LocalTalk

### Electrical Requirements

- Line voltage: 100 to 240 VAC, RMS single phase, automatically configured

- Frequency: 50 to 60 Hz, single phase
- Power: 210 W maximum, not including display

### Size and Weight

- Height: 3.4 inches (8.5 cm)
- Width: 16.3 inches (41.5 cm)
- Depth: 15.6 inches (399.7 cm)
- Weight: 14.0 pounds (6.4 kg) (varies based on internal devices installed)

## Power Macintosh 7100/66 and Power Macintosh 7100/66Av Computers

### Microprocessor

- PowerPC 601 running at 66 MHz with integrated floating-point unit and 32K cache

### Memory

- 8 MB or 16 MB of RAM, expandable to up to 136 MB (DRAM kits must be installed in pairs; dealer installation required)

### Disk Drives

- One built-in Apple SuperDrive 1.4 MB floppy disk drive

- One internal hard disk (250 MB and 500 MB options available)
- Accommodates one 5.25-inch, half-height device, such as the AppleCD 300i Plus CD-ROM drive

### Displays

- All Apple displays
- Third-party displays including NTSC, PAL, VGA, and SVGA monitors

### Video Support

- DRAM display support
- 7100/66: 1 MB of VRAM, expandable to 2 MB
- 7100/66Av: 2 MB of VRAM

### Interfaces

- Three internal NuBus expansion slots
- One Apple Desktop Bus (ADB) port
- AAUI-15 Ethernet connector
- High-density display port supports Apple AudioVision monitors directly and supports other displays through the optional Power Macintosh Display Adapter
- Two LocalTalk- and GeoPort-compatible DMA serial (RS-232/RS-422) ports
- High-speed asynchronous SCSI interface connects up to six SCSI external devices

Corporation. Here are some details on these announcements.

### Newton MessagePad 110

The Newton MessagePad 110 incorporates many new improvements, features, and design modifications based upon suggestions from customers and licensees. The MessagePad 110 has three times the user space of the original Newton MessagePad, longer battery life (alkaline battery life has been doubled and NiCad battery life has been tripled), and a fast recharge feature that

enables NiCad batteries to be fully recharged in two to three hours. The new industrial design features a flip-down protective lid, a round telescopic pen, and a slimmer, sleeker form factor. Here are some of the new features:

- the ability to write something as “ink”—unrecognized handwriting—and have the Newton MessagePad convert it to text later (good for taking notes quickly)
- letter-by-letter character recognition (good for recognizing words not in the internal dictionaries)

• better recognition of names not in the dictionary by the built-in Names address book

- faster compression and decompression of ink
- faster Newton-to-Newton data transfers using the infrared link
- software enhancements made to Newton internal software since its introduction

One important change that Newton developers should note is the Newton MessagePad 100 screen size of 320 by 240 pixels.

This is 16 pixels shorter than the 336-by-240-pixel size of the original Newton MessagePad and the upcoming Newton MessagePad 100. Newton products that are hard-coded to the larger screen may lose important information off the bottom of the Newton MessagePad 110 display.

The Newton MessagePad 110 is currently available in the United States for \$599. It is expected to be available in Canada and the United Kingdom later in March and in some international markets later in 1994.

- 16-bit stereo sound input and output ports
- DB-15 video port for display support
- 7100/66AV only: s-video input and output ports
- 7100/66AV only: digital-audio video connector (DAV)

#### Networking

- Built-in Ethernet
- Two serial ports for LocalTalk

#### Electrical Requirements

- Line voltage: 100 to 240 VAC, RMS single phase, automatically configured
- Frequency: 50 to 60 Hz, single phase
- Power: 325 W maximum, not including display

#### Size and Weight

- Height: 6.0 inches (15.2 cm)
- Width: 13.0 inches (33.0 cm)
- Depth: 16.5 inches (41.9 cm)
- Weight: 25 pounds (11.3 kg) (varies based on internal devices installed)

### Power Macintosh 8100/80 and Power Macintosh 8100/80AV Computers

#### Microprocessor

- PowerPC 601 running at 80 MHz with integrated floating-point unit, 32K cache, and 256K level-2 cache

#### Memory

- Comes with 8 MB or 16 MB of RAM, expandable to up to 264 MB

#### Disk Drives

- One built-in Apple SuperDrive 1.4 MB floppy disk drive
- One internal hard disk (250 MB, 500 MB, and 1 GB options available)
- Accommodates one 5.25-inch, half-height device, such as the AppleCD 300i Plus CD-ROM drive
- Accommodates one full-height 3.5-inch hard disk drive and one removable 3.5-inch device

#### Displays

- All Apple displays
- Third-party displays including NTSC, PAL, VGA, and SVGA monitors

#### Video Support

- DRAM display support
- 8100/80: 2 MB of VRAM, expandable to 4 MB
- 8100/80AV: 2 MB of VRAM

#### Interfaces

- Three internal NuBus expansion slots
- One Apple Desktop Bus (ADB) port
- AAUI-15 Ethernet connector
- High-density display port supports Apple AudioVision monitors directly and supports other displays through a Power Macintosh Display Adapter (included with the 8100/80 only)
- Two LocalTalk- and GeoPort-compatible DMA serial (RS-232/RS-422) ports
- Dual-channel, high-speed asynchronous SCSI interface: one supports up to six external SCSI devices; the other channel, running at double the clock speed, supports an internal hard disk array
- 16-bit stereo sound input and output ports
- DB-15 video port for display support
- 8100/80AV only: s-video input and output ports

- 8100/80AV only: digital-audio video connector (DAV)

#### Networking

- Built-in Ethernet
- Two serial ports for LocalTalk

#### Electrical Requirements

- Line voltage: 100 to 240 VAC, RMS single phase, automatically configured
- Frequency: 50 to 60 Hz, single phase
- Power: 200 W maximum, not including display

#### Size and Weight

- Height: 14.25 inches (36.6 cm)
- Width: 8.9 inches (22.6 cm)
- Depth: 16.0 inches (40.6 cm)
- Weight: 25.3 pounds (11.5 kg) (varies based on internal devices installed)

## We've Got the Power to Be Open, Redux

The delivery of the first Power Macintosh computers means that Apple Computer, Inc., now offers no fewer than seven technologies or products using names with the word *Power* (in addition to two that use the word *Open*). It's essential that you understand what these products are and the differences between them; it's also essential that you be able to explain our products to your staff, customers, clients, bosses, and others. So we thought we'd update the list of "Power" and "Open" products published six months ago to help you understand the difference between these similarly named entities, most of which are important, if not vital, to the success of Macintosh computing.

**OpenDoc** The future direction of Macintosh software. An open cross-platform compound-document architecture designed by Apple and supported by IBM, Sun, Novell, WordPerfect, and Taligent, among others. OpenDoc replaces today's large, single-purpose applications with collections of "parts," each of which consists of one kind of content—for example, a spreadsheet, styled text, or a graph. Software and related materials that will enable you to build OpenDoc parts are expected to begin shipping this year.

**PowerBook** Apple's line of portable, laptop Macintosh computers.

**PowerCD™** Apple's three-in-one CD-ROM drive. It plays CD-ROM titles on a Macintosh computer, enables viewing of Kodak Photo CD images on a television or a Macintosh, and plays audio CDs through a stereo system, headphones, or Macintosh.

**PowerOpen** The successor to Apple's current "open systems" operating system, A/UX. PowerOpen is a new version of the UNIX operating system under joint development by Apple and IBM that will combine the Macintosh user interface with the next release of IBM's AIX. PowerOpen is an alternative operating system for Power Macintosh computers and other PowerPC processor-based computers, as well. Existing and future 680x0 and PowerPC Macintosh applications will run without modification on any computer using the PowerOpen operating system.

**Power Macintosh** A new line of Macintosh computers introduced worldwide by Apple on March 14, 1994; the first personal computers to use PowerPC RISC (reduced instruction set computing) microprocessors; and the first RISC-based systems to run a mainstream personal computing operating system

(System 7). Initial offerings in the line include the Power Macintosh 6100/60 computer, which runs at 60 MHz; the 66 MHz Power Macintosh 7100/66 computer; and the 80 MHz Power Macintosh 8100/80 computer. (Note that the product names contain the processing speed in megahertz.)

Current applications for 680x0 Macintosh computers will run without modification in emulation mode on Power Macintosh computers, although Apple urges you to take your applications native so that they can take advantage of the increased power and new features.

**PowerPC** The high-performance RISC microprocessor family developed by Apple, Motorola, and IBM. Already announced chips in the PowerPC line include the following:

- the PowerPC 601 processor, which runs faster than the fastest 680x0 processor and equals or exceeds Pentium performance
- the PowerPC 603 processor, which provides 601 performance in a smaller, less expensive, more efficient design specially for portables and low-end systems
- the PowerPC 604 processor, with performance two to three times faster than that of the PowerPC 601 processor
- the PowerPC 620 processor, whose performance enhancement over the PowerPC 601 (it's four to six times faster, which makes it ideal for workstations and servers)

**PowerTalk** AOCE system software for Macintosh and PowerBook computers. PowerTalk gives users access to AOCE collaboration services, including a "universal mailbox" for integrated electronic correspondence, an easy drag-and-drop method of sending documents, a catalog capability for access to all kinds of information, and a "digital signature" capability, which enables electronic approval of documents.

**PowerShare** AOCE server software providing server-based collaboration services for AppleTalk networks. Users of Macintosh computers connected to an AppleTalk network can access these services using PowerTalk client software. PowerShare services include a shared store-and-forward facility for electronic messaging, server-based authentication and privacy for secure network communications, and centralized administration of shared catalogs that are distributed across multiserver networks for system scaling with optimal performance.

### Newton MessagePad 100

To give customers a choice between the original Newton MessagePad form factor and that of the new MessagePad 110, Apple announced plans to introduce a new version of the Newton MessagePad—the Newton MessagePad 100.

This device will provide the same software functionality as the MessagePad 110, while maintaining the original form factor. The Newton MessagePad 100 will sell in the United States for \$499. It is expected to be available in the United States and the United Kingdom in April and in some international markets later in 1994.

### New Version of the Newton Toolkit

This new version of the Newton Toolkit—the comprehensive developer system for the Newton platform—is anticipated to be available in early April 1994. The Newton Toolkit is a powerful development environment that uses object-oriented programming and prototypes to reduce significantly the time taken to develop Newton applications. One recent enhancement to the Toolkit is the Newton Book Maker—a new tool that makes it easy to create electronic books. This version of the Newton Toolkit will include a major documentation revision, greater robustness of the Toolkit itself, performance improvements for both the Toolkit and the applications it creates, and the ability to create Newton screen shots.

The new version of the Newton Toolkit will be available in April 1994. The current beta version is available from APDA for \$795 (United States, 800-282-2732; Canada, 800-637-0029; international, 716-871-6555). Purchasers of the beta version of the Newton Toolkit will receive the final version by mail in April 1994.

**Upgrade Program for Original MessagePad Owners**

To enable Newton customers to benefit from the rapid evolution of Newton technology, Apple will offer existing owners of the Apple Newton MessagePad an attractive upgrade program.

The Newton software upgrade program will give the original Newton MessagePad the same software functionality as the new MessagePad 110. The upgrade program will include the customer's choice of two of the following floppy-based Newton software products: Newton Connection Kit for Macintosh or Windows, Dell Crossword Puzzles and Other Games, DrawPad, or Dyno NotePad.

This upgrade package will cost \$99; it will be available in the United States and the United Kingdom in April 1994 and in some international markets later in 1994. U.S. customers can order this upgrade by calling 1-800-SOS-APPLE.

**Newton Connection Version 2.0 for Macintosh and Windows**

Newton Connection version 2.0 for Macintosh enables Macintosh users to exchange and share their MessagePad information—notes, letters, name-cards, to-do lists, appointments, and even information created with many third-party applications—with common desktop personal information management (PIM), word-processing, spreadsheet, and database applications, including Portfolio Software's Dynodex, Aldus' Date-BookPro, Microsoft's Excel, Word, and Works, WordPerfect, Lotus 1-2-3, and WriteNow. By using tab-delimited or comma-delimited files, users can exchange information between the Newton MessagePad and various programs. The Newton Connection Kit version 2.0 is currently available in the United States for \$99.

**The Newton Solution**

Apple will be offering three Newton software packages from StarCore, each containing a suite of business solutions designed to help mobile executives work more effectively. Each Newton Solution package is compatible with all products in the Newton family, and incorporates two applications designed to meet the needs of sales people, mobile professionals, or business executives.

The Newton Solution products announced are the Mobile Sales Manager (which includes Money Magazine Business Forms and GeoAssist), Professional Idea Manager (which includes Dyno NotePad and Mobile Math), and Executive Productivity Manager (which includes PresenterPad and Economist World in Figures). These products ship on a 2 MB flash card and will be available in the United States in March for \$199.

**Toshiba to License Newton Technology**

Apple announced the licensing of Newton technology to Toshiba Corporation, which says it intends to develop a new line of Newton-based products.

Toshiba also becomes a founding member of the Newton Industry Association, which was announced at the First International Newton Development Conference in December 1993. The participants of the inaugural session included, among others, BellSouth MobileComm, Kyushu Matsushita, Motorola, Sharp, Siemens/ROLM, and US West. This association is a forum for promoting the growth of the Newton platform and compatibility of Newton devices. The association will also promote standards for Newton devices in the areas of wireless communications, telephony support, and office automation.

**New Study Finds Macintosh More Productive Than Windows**

Since you're reading *Apple Directions*, we can only assume that you share Apple's intuitive belief that Macintosh computers provide a vastly superior user experience to that offered by personal computers running Windows. Now there's conclusive data to back up that belief:

According to Arthur D. Little, a consultant based in Cambridge, Massachusetts, the Macintosh computer is "a fundamentally more productive platform... than a comparable Windows machine for a broad range of

typical business computing activities."

Apple Computer, Inc., who commissioned the study, is using its results to help attract new users to the Macintosh platform and build market share for Macintosh products.

Summarizing its results here is a little like preaching to the converted, but you can use the data to help your own Macintosh product marketing efforts and, within your organization, to help convince any skeptics about the advantages of developing for the Macintosh platform.

The study took a group of more than 100 business computer users and measured their productivity completing 24 different computing tasks drawn from 11 general task groupings, including editing documents, managing files, and printing. The users—58

**Macintosh and Windows Users: Average Time to Complete Tasks**

Task Grouping	Macintosh users (minutes)	Windows users (minutes)	Macintosh advantage* (%)
Managing files	6.5	20.3	68
Checking system resources	4.5	11.3	60
Printing across the network	3.2	7.5	57
Recovering files	2.0	4.6	57
Exchanging files on the network	3.8	7.9	52
Installing an application	8.7	15.3	43
Checking for an application	4.0	6.4	38
Sharing files	6.2	9.8	37
Editing a compound document	6.3	9.4	33
Installing the operating system	8.0	10.0	20
Installing peripherals**	9.5	10.8	12
<b>Total</b>	<b>62.7</b>	<b>113.3</b>	<b>44</b>

\* Indicates how much less time (on a percentage basis) it took Macintosh users to complete each grouping of tasks than it took Windows users to complete the same tasks.

\*\* In installing peripherals, Windows users were not required to open their computers to install any interface cards.

Macintosh users and 55 Windows users in all—all had at least three years' experience working with their platform of choice. Their performance was evaluated in two areas: time taken to complete a task and success or failure in completing the task correctly. Macintosh users completed the 24 tasks in 44 percent less time, and were almost 50 percent more likely to complete all the tasks correctly.

Looking at some of the specific tasks, Macintosh users needed 68 percent less time than their Windows counterparts to manage files, 33 percent less time to edit a document, and 57 percent less time to print a document to different printers. The chart "Macintosh and Windows Users: Average Time to Complete Tasks" (page 15) shows that Macintosh users consistently outpaced their Windows peers on each of the 11 task groupings. Overall, Macintosh users completed 85 percent of their tasks correctly, while Windows users completed 58 percent of theirs correctly.

Comments by study participants provided additional, if more subjective, evidence of the tangible productivity advantage of the Macintosh platform over Windows. The majority of Macintosh users in the study said that they found the test easier than they had expected and that they were able to take on and resolve unfamiliar tasks. The majority of Windows participants, however, said that the test was harder than they had expected and that they had difficulty dealing with unfamiliar tasks. In addition, they showed higher levels of frustration and said that they had some difficulty with the time allotted for the tasks, virtually a nonexistent complaint for the Macintosh users.

The complete study is available on AppleLink in the same folder as *Apple Directions* (path—Developer Support: Developer Services:Periodicals).

## QuickTake 100 Digital Camera for Macintosh and Windows Computers

Apple Computer, Inc., recently introduced the QuickTake 100—a "filmless" point-and-shoot digital camera that offers fast capture of 24-bit color images for use on both Macintosh and Windows computers. By removing many of the steps in the traditional image capture/film development/scanning chain now used to bring images into computers, the QuickTake 100 camera breaks new ground in color image access. At \$749 (United States only), the QuickTake 100 is priced to be far more affordable than digital cameras to date. Apple worked with Eastman Kodak Company to bring this product to market.

Weighing only a pound with batteries installed, the QuickTake 100 is portable and easy to use. It comes equipped with built-in automatic flash and icons that indicate flash and battery status, the number of pictures remaining and taken, selected resolution, and self-timer settings.

The camera's lens focuses from four feet to infinity and has apertures from f2.8 to f16. The automatic exposure is computer controlled with shutter speeds from 1/30 to 1/175 seconds. It includes a built-in automatic flash, countdown timer, and tripod mount. The QuickTake 100 comes with a software application that permits image transfer, thumbnail viewing, and image file transfer. File formats include PICT and TIFF (in the Macintosh version) and BMP, PCX, and JPEG (in the Windows

version). It runs on standard AA batteries, which can capture approximately 120 images before requiring replacement.

To load images into a Macintosh or Windows computer, you simply connect a serial cable from the QuickTake 100 to the computer's printer or modem port. QuickTake software then transfers images to the computer within seconds.

The QuickTake 100 captures two image sizes, 320 by 240 pixels (standard resolution) or 640 by 480 pixels (high resolution), and stores those images in internal memory until the user loads them into a computer. It can store up to thirty-two 320-by-240 images or eight 640-by-480 images.

The Macintosh version of the QuickTake 100 camera is expected to ship worldwide in late March, with the Windows version scheduled for worldwide release in June.

### Developer Notes

Applications can be programmed to manipulate the QuickTake 100 camera, including getting the current status of the camera, getting an image already stored in the camera (or information about it), erasing images, and capturing new images.

A preliminary developer note on QuickTake 100 is available on the April 1994 Developer CD. This document contains information on the QuickTake 100 driver software, serial port, and image file format. It also describes how to display a QuickTake 100 image on both Macintosh and Windows computers.

## New Video Highlights Macintosh Benefits Over Windows

To help you understand and communicate how the Macintosh computer is better than its competition, Apple Computer, Inc., has produced a video that demonstrates the key Macintosh benefits over a DOS/Windows personal computer. "Macintosh vs. Windows: 1994" compares the Macintosh with a PC running Windows using the criteria that are most important to individuals buying computers today, including

- price
- compatibility
- ease of use
- available applications
- expandability
- future capabilities

The premise of this video is that while Windows has helped to make the IBM-compatible PC look like a Macintosh computer, independent research has shown that it can't make a PC work like a Macintosh. In study after study, users say they're more productive and more satisfied with Macintosh than with Windows (see related story on page 15). Using side-by-side demonstrations, this video shows why Apple feels certain that the Macintosh computer is better than a PC running Windows.

Copies of this 23-minute video (item number V10005) are available for \$8 plus postage and handling. In the United States, call 800-825-2145; from locations outside the United States, dial 303-297-8070.



## QuickTime 2.0 Supports Full-Screen Video, MPEG, Music

Apple Computer, Inc., recently announced a new version of QuickTime, its cross-platform software that brings multimedia capabilities to personal computers and consumer-electronic devices. The newest version, QuickTime 2.0, provides larger video images at faster frame rates and support for music and interactive television applications.

Video on computers is often confined to small windows and played at fewer than 12 frames per second, making the video appear rough and jerky. QuickTime 2.0 provides faster, software-only playback of full-screen movies. For example, on a Macintosh LC 475 computer, 30 frames-per-second (fps) video is possible at a resolution of 320 by 240 pixels, or full-screen video (640 by 480 pixels) is possible at 15 frames per second.

Key components of QuickTime 2.0 video enhancements are new features that support professional-level video editing. QuickTime 2.0 includes support for SMPTE (Society of Motion Picture and Television Engineers) time codes, 60 fps video, and data throughput greater than 3 MB per second. This represents a 300 percent increase over previous versions of QuickTime.

The new version of QuickTime 2.0 also creates an infrastructure for development and delivery of interactive television applications through MPEG (Motion Pictures Experts Group) support and network enhancements. QuickTime 2.0 supports MPEG compression, widely regarded as the industry-standard method of delivering video into the home

for interactive television applications such as video on demand (VOD) and home shopping. MPEG, by itself, allows only playback. With QuickTime 2.0, however, users of MPEG-based devices will be able to edit, search for, interact with, and play back video information.

QuickTime 2.0 makes it easier for computer users to create, edit, play back, and synchronize music with video, using the industry-standard MIDI (Musical Instrument Digital Interface) data format for music tracks. These music capabilities will save disk space for users, because music tracks created with QuickTime 2.0 will be much smaller than digital audio.

QuickTime 2.0 will run on any color-capable (68020 or later) Macintosh computer with at least 2 MB of memory running any version of System 7 or System 6.0.7.

QuickTime 2.0 is expected to be available on the Macintosh computer in the middle of 1994, with developer seeding planned to begin in March. As with previous versions, QuickTime 2.0 is designed to permit compatibility across all platforms that support it.

## New Installer Offers Many New Features

Software installers (used to automate the installation of your software onto your customer's system) are a fact of life. Macintosh systems have gotten complicated enough that there are many programs a customer can't install simply by copying files from a floppy disk to a hard disk. Apple's Installer program has provided one way of delivering

easy software installation to your customers, and a new version, Installer 4.0, which works for both 680x0 and PowerPC processor-based Macintosh computers, can make installation easier for both you and your customers.

Here are some of Installer 4.0's many important enhancements:

- It supports integrated decompression of files, resources, and fonts. Through the Atom Extender feature, the new Installer provides an open architecture for third-party compression/decompression services.
- It gives users the ability to install on the Installer's volume. The Installer checks to ensure that no source file will be overwritten.
- It supports very large files, resources, and fonts. You can split large files and resources across source disks and the Installer automatically rejoins them during installation.
- It provides modeless operation. If an error (such as low disk space) occurs, the user can switch to the Finder and correct the problem without quitting the Installer.
- It provides an enhanced user interface. You can now move and resize the application window, which displays available and requested disk space.
- It runs most Installer 3.1 through 3.4.x scripts.

The golden master version of Installer 4.0, which also includes numerous bug fixes from the previous version, can be found on this month's Developer CD in the What's New folder. You need to be aware that the licensing agreement for the new Installer is different than from the agreement for previous versions; for details, contact Apple Software Licensing (AppleLink: SW.LICENSE).

## 1994 Worldwide Developers Conference to Be Held May 15-20

For the first time in recent memory, you won't have to skip Mother's Day to attend the Worldwide Developers Conference (WWDC) this year.

Apple Computer, Inc., will hold the conference from May 15 to 20 at the San Jose Convention Center. This year's WWDC is expected to be the biggest ever. It will feature in-depth technical sessions on OpenDoc, PowerPC, Newton, and as-yet-unannounced new Apple technologies. Also, in response to feedback from last year's participants, there will be more small break-out and detailed hack sessions. The conference also provides you your yearly opportunity to meet and exchange ideas with the best and the brightest Macintosh and Newton developers, both from inside and outside of Apple.

The conference is wide open this year, to anyone who develops products or solutions using Apple technologies, sells products based on Apple platforms, or is simply interested in Apple's technology directions. So, whether you're a programmer, a technical or marketing manager, a consultant, a systems integrator, or anyone else with a stake in inside information about Apple, you'll want to attend the 1994 WWDC.

For more information, write 1994 Apple Worldwide Developers Conference, CMI, 120 Montgomery Street, 5th Floor, San Francisco, CA 94104, U.S.A., or send a fax to 415-598-4301. Information and electronic registration forms are also available on AppleLink (path—Developer Support:Developer Services:Events/Marcom:WWDC). ♣

# Technology

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## develop Issue 17: Two PowerPC Articles

To go along with this month's announcement of the Power Macintosh computer, Issue 17 of *develop* (Apple's award-winning technical journal) contains not one but two articles related to PowerPC technology. There's also a Newton article and much, much more.

- "Standalone Code on PowerPC" explains how standalone code is better and easier than ever before in the PowerPC environment, and "Debugging on PowerPC" tells how your hard-won debugging skills work in the new world.
- "Using Proto Templates on the Newton" gives Newton developers a sample game that uses proto templates to good effect, and gives everyone else a flavor of what Newton development is like.
- "Concurrent Programming With the Thread Manager" shows how, with both cooperative and preemptive threads, the possibilities provided by the new Thread Manager are nearly endless.
- "The Zen of Window Zooming" tells you how to do window zooming right and gives some code to help you out.
- "Tracking QuickDraw GX Messages" describes how MessageWatcher lets you spy on QuickDraw GX printing.
- "Cross-Platform Compatibility and Multiple-Movie Files" provides useful

*please turn to page 25*

## CD Highlights

# System Software Edition, April 1994

Spring is in the air, and the System Software Edition of the Developer CD is in your mailbox, featuring 120 MB of new and revised system software, tools, utilities, and technical documentation. Of special interest are two new Inside Macintosh volumes: *Inside Macintosh: Networking* and *Inside Macintosh: PowerPC System Software*.

To fit this much new material on a disc that was already full, we've had to temporarily move a few things. While new versions of QuickTime for Finland and Norway can be found in the What's New folder on this disc, the rest of the QuickTime folder will be found on next month's Tool Chest Edition. Also, Performa system software and printer drivers (except for LaserWriter 8.1.1) have been temporarily omitted and will appear again on the next System Software Edition in July 1994 (as will, I hope, the boot-everything System Folder I mentioned last month).

Another new addition of interest this month is the survey located in the CD Info folder. It's short, sweet, and no longer in HyperCard, so it's much easier to fill out and send in. I love feedback, and I don't get nearly enough, so please take a minute or three to let me know what you think of the Developer CD Series. Completed surveys can be sent to the AppleLink address DEV.CD, the Internet mail address [dev.cd@applelink.apple.com](mailto:dev.cd@applelink.apple.com), or by SnailMail to Developer CD Series, Apple Computer, Inc., 3 Infinite Loop M/S 303-4DP, Cupertino, CA 95014, U.S.A.

Here's some of this month's new and revised material.

### AppleScript 1.1

This folder contains the complete AppleScript run-time package, including the scriptable Text Editor, Script Editor, AppleScript, and sample scripts.

### Apple Shared Library Manager (ASLM) Version 1.1.1 SDK

ASLM provides an API for shared library support on the Macintosh, allowing you to create and use dynamically linkable and loadable libraries that can be shared by different applications.

This version provides bug fixes to ASLM 1.1. It is binary compatible with ASLM 1.1 clients and shared libraries; you don't have to rebuild libraries for them to work with ASLM 1.1.1. See the Change History document for a list of changes and bug fixes.

### ColorSync 1.0.4

ColorSync, Apple's color-matching architecture for the Macintosh computer, is a system extension that provides consistent color across the system. The key components of ColorSync are the ColorSync extension, the ColorSync System Profile control panel, and ColorSync Profiles for Apple color monitors.

With ColorSync 1.0.4, ColorSync functions are now separated into separate extension and control panel files. The new version also provides support for both 680x0 and PowerPC processor-based

*please turn to page 28*

# Understanding the Power Macintosh Architecture, Part One: Overview

By Gregg Williams  
Apple Directions staff

It's been said that the opposite of a truth is a falsehood, but that the opposite of a great truth may be another great truth. Though I don't mean to ascribe cosmic significance to Apple's new Power Macintosh computers, that saying does have some relevance to this article. Paradoxes abound: The Macintosh platform is the same (almost all existing applications still run), but it's all new (it's based on a completely different processor). Macintosh development is almost the same (you just program as you always have), but in some ways it's completely different (you still have to know some new things, even if you end up *not* having to change your code because of them).

In this two-part article, I'll try to explain the Power Macintosh architecture in a way that will show, first, its simplicity and, second, the complexity behind the simplicity. I hope you'll walk away from this article with a clear idea of what's going on inside a Power Macintosh computer and what steps you should take to modify existing software and create new Power Macintosh software. Most importantly, I'll point you to the documentation you need to read to get the full story. In particular, the new *Inside Macintosh: PowerPC System Software* is one book that every Macintosh developer needs to read—*now*. (See the "Resources" text box for details on how to get a copy.)

## System Software Is Key

It's no accident that this article uses the phrase *Power Macintosh* a lot and *PowerPC* very little—more evidence that "It's still a Macintosh." Almost all the material you'll see in this article (and in *Inside Macintosh: PowerPC System Software*) is totally absent from, say, the *PowerPC 601 User's Manual*.

In other words, the differences that matter are at the system software level, not the hardware level. You will continue to program to the Macintosh API (application programming interface), with a few exceptions, exactly as you have in the past. As a matter of fact, if Apple Computer, Inc., hadn't spent the last five years (to use a euphemism) *strongly encouraging* you to program to this API, which was designed to isolate your program from hardware specifics, the transition to Power Macintosh wouldn't have been possible.

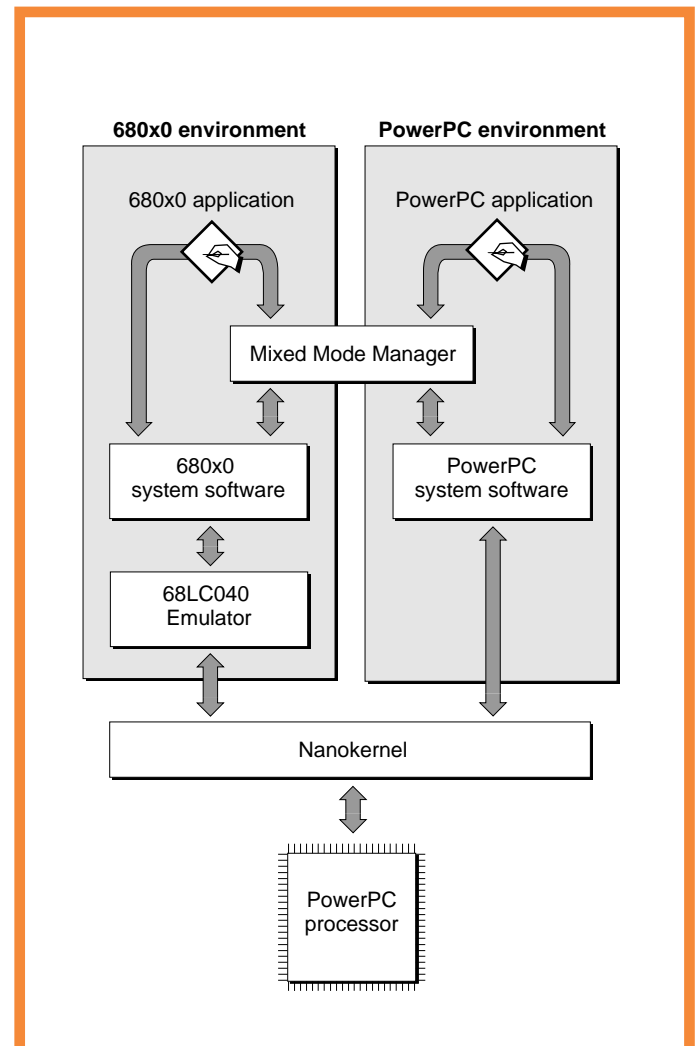
As *Inside Macintosh: PowerPC System Software* author Tim Monroe notes in his "An Introduction to Apple's PowerPC Documentation" text box (see page 20), the original Macintosh architecture is firmly tied to the 680x0 processor family. "How in the world," he asks, "are they going to get all that stuff to run on the PowerPC platform? The answer, of course, was simple: Rewrite as much of it as you can in a high-level language, recompile it to PowerPC code, and emulate the rest of it." To which I might add, it was also essential for Apple engineers to find the code that most often executed—QuickDraw, for example—then

rewrite and recompile it to native PowerPC code.

## Overview

The figure "Power Macintosh Software Architecture" (below) shows how these new computers manage to run both 680x0 and PowerPC software. The 68LC040 Emulator makes it possible for

Power Macintosh computers to run 680x0 code, including applications, extensions, and patches. A new piece of system software, the Mixed Mode Manager, makes it possible for applications (and other software) to run both 680x0 and PowerPC routines, without knowing or caring what the instruction set of a given routine



**Power Macintosh software architecture. The Mixed Mode Manager and the 68LC040 Emulator make it possible to run both 680x0 and PowerPC applications on Power Macintosh computers.**

is. (Note that, for various technical and compatibility reasons, some Macintosh system software remains as 680x0 code.)

The nanokernel is system software that mediates between higher-level software and the PowerPC hardware; it provides low-level services such as interrupt handling and hardware memory mapping. The nanokernel is important because it provides an entry point for the future evolution of the Power Macintosh architecture.

Two other pieces of system software deserve mention:

- *The Code Fragment Manager*: Power Macintosh software is based on a unit of software called a fragment (discussed later in this article). This manager loads fragments into memory and prepares them for execution. Its operation is transparent to most software.

- *The Exception Manager*: This manager handles exceptions

that occur during the execution of native PowerPC code; most PowerPC code doesn't need to know about it. The 68LC040 Emulator and the overall Power Macintosh architecture handle 680x0 exceptions correctly.

There's more to compatibility than just what follows, but I

with both the Virtual Memory Manager and Process Manager. As a rule of thumb, if your software runs on a Macintosh Quadra 605 or any other Macintosh computer that uses the Motorola 68LC040 processor, it will probably run on any Power Macintosh computer. (FYI, other models that use the

of any sort that makes commercial sense. In the past, hardware emulation has always been too expensive, and software emulation has been either imperfect (making it useless) or too slow. Thanks to the engineers involved, this emulator is very close to perfect; in fact, I was told that no incompatibility has been traced to the 68LC040 Emulator. Thanks to the speed of the PowerPC processor, the first Power Macintosh computers are fast enough to run emulated software at speeds ranging from the high 68030 to 68040 levels.

One ramification of the 68LC040 Emulator you should be aware of is the lack of Motorola 680x0-family floating-point and memory-management functions. Since the 68LC040 processor itself does not include any 680x0 floating-point (68881 or 68882) or memory-management (68851) functions, the 68LC040 Emulator

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**In my 15 years in the personal computer business, this is the first time I've seen processor emulation of any sort that makes commercial sense.**

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thought I'd mention a few "ground rules" that are essential preconditions to having 680x0 applications that work on Power Macintosh computers. (You should be following these guidelines for today's software, anyway.) Software must be 32-bit clean and must be compatible

68LC040 processor include the Macintosh LC 475 and some of the older Macintosh Centris 610 computers.)

#### **68LC040 Emulator**

In my 15 years in the personal computer business, this is the first time I've seen processor emulation

## An Introduction to Apple's PowerPC Documentation

By Tim Monroe

I must confess that when, about two years ago, I first learned of the plan to port the Macintosh operating system to the PowerPC microprocessor, I had my doubts. I wasn't worried so much that it could be done at all, but rather that it could be done by early 1994. Two years to move an entire operating system from one microprocessor to another seemed like precious little time. Yet the project leaders seemed intent on introducing the first PowerPC processor-based Macintosh computers on or about the 10th anniversary of the Macintosh.

Of course I had good reasons to be skeptical. You can't program the Macintosh for very long without discovering just how closely the Macintosh OS depends on the features of the 680x0 family of processors. The technical documentation for the Macintosh

system software—*Inside Macintosh*—is full of programming techniques that require you to flush microprocessor caches or read information out of specific microprocessor registers. Want to write a task that executes periodically? If you use the Time Manager, chances are you'll need to get some information out of register A1 when your task starts up. And, if you want to do anything interesting in that task (such as access your application's global variables), you'll also need to reset the value in register A5. In short, it's a low-level mess, albeit a well-documented mess.

More generally, it's common knowledge that most of the Macintosh OS and system software was originally written in 680x0 assembly language. How in the world, I thought, are they going to get all that stuff to

run on the PowerPC platform? The answer, of course, was simple: Rewrite as much of it as you can in a high-level language, recompile it to PowerPC code, and emulate the rest of it. Happily, this twin approach has worked exceptionally well, providing both compatibility with existing 680x0 code and significantly increased speed for rewritten system software and applications.

The steps you need to follow to make the gentle transition from 680x0-based Macintosh to the PowerPC processor-based Macintosh are explained in detail in the book *Inside Macintosh: PowerPC System Software*. This book shows how the PowerPC run-time environment is both cleaner and more powerful than the 680x0 run-time environment. The result is that, where they differ, the PowerPC application

doesn't, either. Your application shouldn't depend on these instructions anyway, because then it wouldn't run on the Macintosh models mentioned earlier.

In a few cases, the behavior of the 68LC040 Emulator is different from that of a 68LC040 processor; see pages 1–8 through 1–12 of *Inside Macintosh: PowerPC System Software* for details. Most of these differences affect only very few programs (bus error handlers, for example), pertain to things you shouldn't rely on anyway (byte smearing), or might be relevant only during debugging.

### Floating-Point and Memory-Management Issues

If your application uses SANE (Standard Apple Numerics Environment) routines for floating-point calculations, they will continue to work: The Power

Macintosh software includes the SANE routines, recoded for the PowerPC processor. However, the floating-point instructions built into the PowerPC processor are *much* faster, and Apple strongly encourages you to convert your program to use them. (Almost every Power Macintosh computer developer has, so far. In a floating-point-intensive test program—not a benchmark of overall performance—a Power Macintosh 6100/60 computer running a PowerPC version ran 15 times faster than a Macintosh Quadra 840AV running an equivalent 680x0 version.)

Be aware, however, that the PowerPC floating-point instructions work on 32-bit and 64-bit floating-point numbers, while SANE uses an 80-bit format. (Power Macintosh software routines allow the manipulation of two 64-bit values as a 128-bit value.) You will need to take

issues of numeric accuracy and possibly file-format compatibility into account when deciding how to handle floating-point calculations within your Power Macintosh application.

In the unlikely event that you have written code that does 680x0-style memory management, you need to use the native memory-management functions of the PowerPC processor. For one thing, the virtual memory of Power Macintosh computers is implemented using them, and your Power Macintosh software should be compatible with that.

### Fragments

*Fragments* are the cornerstone of the Power Macintosh software architecture. Before you can understand much of how Power Macintosh computers work or how to make your software work on them, you must understand what fragments are.

In the Power Macintosh software architecture, a fragment is any unit of executable code and its associated data. Fragments are stored in *containers*, which can be any logically contiguous piece of storage (including ROM, a resource, or the data fork of a file). All PowerPC software is loaded into memory as fragments—including applications, code resources, extensions, and shared code (called *import libraries*).

Fragments have several important advantages:

- They simplify the programming process by making all software routines callable in the same way. In the 680x0 world, you must call a routine differently in different situations—one way if it's in your own program, another if it's in an extension.
- On the 680x0 side, only applications have global data. On the Power Macintosh platform,

programming interfaces (APIs) are cleaner and simpler than the corresponding 680x0 APIs. This makes your job as a software developer easier and reduces your time-to-market.

If your application does floating-point calculations, you'll want to use the new and improved numerics environment, documented fully in the book *Inside Macintosh: PowerPC Numerics*. PowerPC Numerics is a fully IEEE 7543-compliant implementation of floating-point operations. It replaces SANE, which is the 680x0 floating-point numerics environment.

To generate PowerPC applications and other kinds of software, you can use the Macintosh on RISC Software Development Kit (SDK), available from APDA (see the "Resources" text box for details). The SDK includes documentation of the PPC compiler, the PPCAsm assembler, and the Macintosh Debugger. The SDK also includes the book *Building Programs for Macintosh With PowerPC*, which describes the tools and processes used in building software that runs on Power Macintosh computers.

If you have developed a 680x0 application or other software, it's extremely likely that it will execute without modification on a PowerPC processor-based Macintosh. That's because the PowerPC system software provides a very complete 68LC040 Emulator. While there are a few operational differences between the Emulator and an actual 68LC040 microprocessor, those differences are not likely to cause problems for your software.

If you want to recompile your source code for the PowerPC platform, you'll need to make a few changes to it. Obviously, you'll need to remove any dependence on the 680x0 architecture contained in your code. For example, the Time Manager task mentioned earlier no longer gets information passed to it in register A1. Instead, that information is passed as a parameter to your Time Manager task. You simply don't need to worry about where exactly that parameter is stored. And you don't need to worry about the A5 world anymore, because there isn't any A5 world in PowerPC code. Rather, your Time Manager task is contained in a fragment, which automatically has access to its own global variables. By reworking the

run-time environment for PowerPC software, Apple engineers were able to simplify your programming work.

In a few cases, you might also need to signal to the operating system the instruction set architecture of some code. The OS cannot tell, just by looking at a chunk of executable code, whether it's 680x0 code or PowerPC code. In general this isn't a problem, since the OS knows, when your application is launched, what kind of code it contains. But when you pass the address of some of your code to some external caller (such as the system software itself), you must make sure to indicate what kind of code it is. You do this by prefixing a routine descriptor to that code. The routine descriptor contains essential information about a routine and its calling conventions.

I can only scratch the surface here. For complete details about how to port your application, turn to the books I've mentioned above. They're available through APDA or your local bookseller.

*Tim Monroe is the author of Inside Macintosh: PowerPC System Software.*

every routine has access to the global data (the data section) of the fragment that contains it. This means that a lot of executable non-application code is easier to write, and you no longer have to manipulate the A5 register to access global data. Also, a fragment's data area can be any size (as opposed to a maximum of 32K for 680x0 applications).

- Fragments will make shared libraries and drop-in additions (like Adobe Photoshop filters) more commonplace. (Both are possible in the 680x0 world, but they are easier to implement and, in some cases, more powerful in the Power Macintosh software architecture.)

- Because of fragments and the Code Fragment Manager, you no longer have to worry about segmentation. When virtual memory is on, the Code Fragment Manager maps the entire code section (the code part of the fragment) into the logical address space; however, the virtual memory system will bring the necessary code into memory as needed. So, in the Power Macintosh world, your life is simpler because you don't need to worry about segmentation. In fact, if you port your

source code from 680x0 to PowerPC, Power Macintosh compilers ignore any segmentation commands that you leave in.

(By the way, the Power Macintosh architecture makes virtual memory faster and more efficient than it is in the 680x0 world. On Power Macintosh computers, executable code is position-independent and read-only. Because of this, when memory needs to be used for something else, there's no need to write it out to a hard-disk "backing store" file—it's already in the application's file. When the same code is needed in memory again, system software gets a new copy from the application. This way, virtual memory runs faster and doesn't waste disk space.)

- You can have special initialization and termination routines run when a given fragment is loaded into and out of memory. This simplifies your program and makes your code more readable.

**Kinds of Fragments**

Fragments are used for different things:

- An application is a fragment that the user can launch from the Finder.

- An import library fragment contains code and data that can be accessed by other fragments.

- An extension is a fragment that extends the capabilities of another fragment.

Extensions and import libraries are examples of *shared libraries*, because they contain code and data that can be shared. They are also called *dynamically linked libraries*, because the link made between them and the application that uses them is made dynamically, when the application is launched.

**Import Libraries**

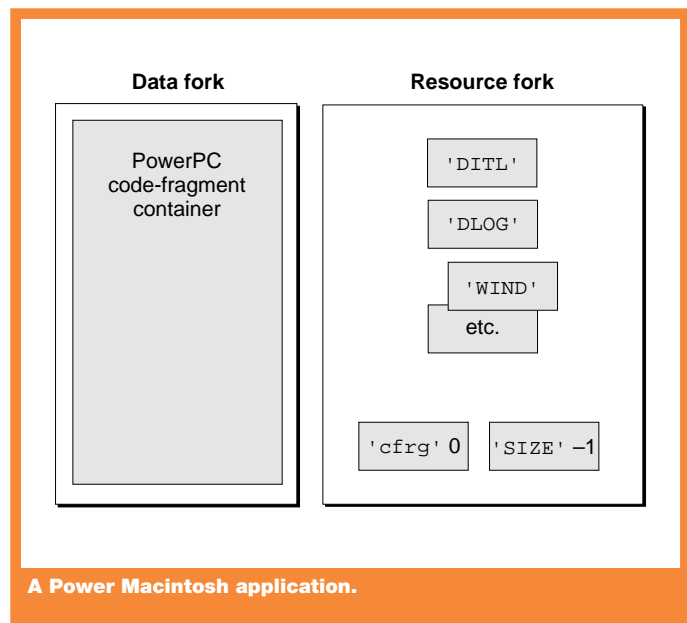
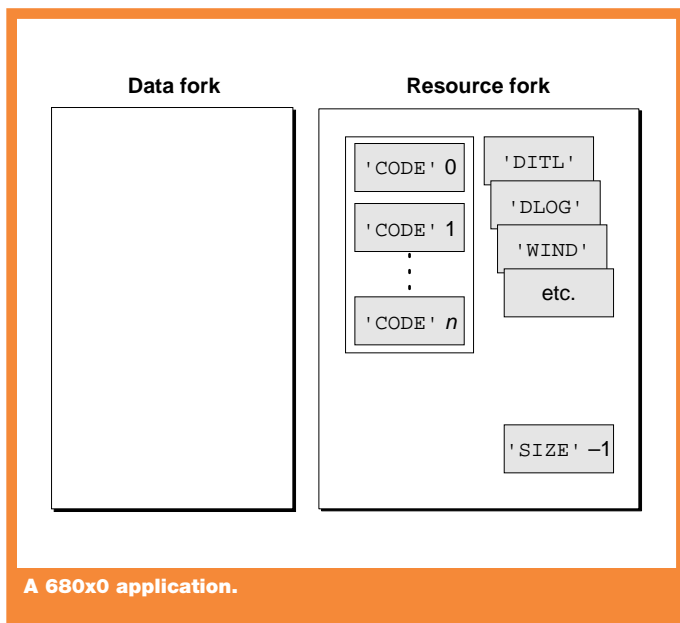
One important use for shared libraries is as *import libraries*. If two or more applications use the same code, you can factor it into an import library and save both memory and storage space. Import libraries are useful even if you have only one application that uses them. By placing infrequently used code in them, you can make your application load faster and use memory more efficiently.

Here's how import libraries work. When you link an import library with another fragment (your application, for example), the linker does not copy the

import library into the application's code. Instead, it looks at the import symbols (commonly called *imports*) that the application already contains; imports refer to external routines—that is, routines not in the application's fragment. The Code Fragment Manager finds the fragments that contain the routines being imported and resolves these imports (a process called *fragment preparation*) when it loads the import library fragments into memory. (An import library must declare its own export symbols, or *exports*, so that the Code Fragment Manager can do its job.) The imported symbols in a fragment are contained in that fragment's *table of contents* (or TOC).

If you improve an import library (keeping its interface the same, of course), you do not have to recompile all the applications that use it for them to work together. This means that the more code you implement as import libraries, the more of your application you will be able to fix or improve without having to ship your entire application to your installed base.

Import libraries also have some features that are not found in today's 680x0 shared libraries (as



implemented by the Apple Shared Library Manager):

- Because import libraries are fragments, they can have initialization and termination routines that run automatically when they are loaded into and out of memory.

- Import libraries can be set to store either one copy of its global data for use by all applications that use it (global instantiation) or a separate copy for each application (per-context instantiation). In addition, if the application explicitly loads an import library using the Code Fragment Manager, the application can request a separate copy of the import library's global data for each time the import library gets loaded (per-call instantiation). This makes import libraries more useful and easier to write than ASLM files, because different callers of the same import library don't have to coordinate the use of one global data area.

### Extensions

Extensions come in two flavors: application extensions, which are used by only one application, and system extensions, which are used by multiple applications or system software. (By the way, you could consider drop-in

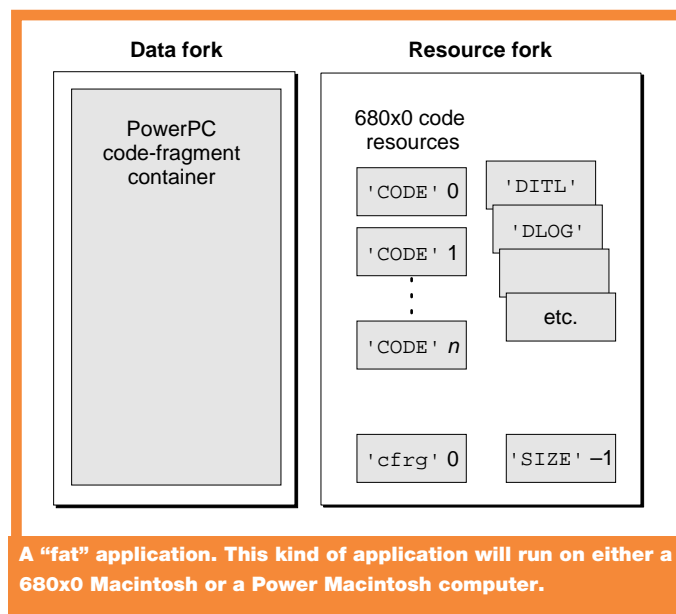
additions to be a kind of application extension.)

Fragments make extensions easier to write. Because every fragment (including applications) can export its symbols, an extension can import symbols from the application that calls it. This makes the implementation of callback routines much simpler than in the 680x0 world.

### Application File Structures

I'll close the first half of this article by showing how a Power Macintosh computer can know the difference between a 680x0 and a native PowerPC application. "A 680x0 application" (see page 22) shows that the structure of a 680x0 Macintosh application remains unchanged. (It has to, for existing 680x0 Macintosh applications to work.) Contrast this to "A Power Macintosh application" (page 22), which has two important differences—the Power Macintosh application, in the data fork, and a new code-fragment resource in the resource fork (along with all the other resources the Power Macintosh application needs).

The data fork contains a fragment container, which contains the Power Macintosh fragment



## Resources

Here is a list of the documentation and tutorial material available from APDA. Prices given here are for the United States market only. You can call APDA from the United States at 800-282-2732, from Canada at 800-637-0029, and from elsewhere at 716-871-6555.

- Macintosh With PowerPC Starter Kit (#R0563LL/A, \$39.95). This documentation kit includes the *PowerPC 601 RISC Microprocessor User's Manual*, *Inside Macintosh: PowerPC System Software*, *Migrating to Macintosh With PowerPC Checklist*, and *PowerPC Technology: An Overview for Third-Party Developers*. This is the basic documentation for developing on Power Macintosh computers.

- *Inside Macintosh: PowerPC System Software* and another document, *Developer Note: Power Macintosh Computers (Macintosh Developer Note #8)*, are on this month's Developer CD, pathname Dev.CD Apr 94:What's New?:Reference Library.

- Programmer's Introduction to RISC and PowerPC (#R0172LL/A, \$150). This is a CD-ROM-based self-paced tutorial from Apple Developer University. Its purpose is to introduce you to the technical issues associated with porting and enhancing existing 680x0 code and writing new PowerPC programs.

- Metrowerks CodeWarrior Gold (#T0937LL/A, \$399). This product includes a C/C++ environment that can compile to either 680x0 or PowerPC code, as well as, other development tools.

- Macintosh on RISC Software Development Kit (#R0543LL/E, \$399). This is an MPW-based environment that allows you to create native PowerPC code for Power Macintosh computers. It contains all the software tools and information you will need to port existing applications or create new ones. It requires a Macintosh computer with at least 20 MB of memory, a 68020 (or faster) processor, System 7 or A/UX 3.0 or later, 20 MB of hard-disk space, and a CD-ROM drive.

- The Macintosh With PowerPC Developer's Bundle (#B1864LL/A, \$849). This bundle contains the Macintosh on RISC Software Development Kit, Programmer's Introduction to RISC and PowerPC, and Metrowerks CodeWarrior Gold.

Additional resources include the following:

- "Making the Leap to PowerPC," by Dave Radcliff, in *develop*, issue 16 (December 1993). This article is also on the March 1993 Developer CD (path—Dev.CD Mar 94:Reference Library:Periodicals:develop:develop Issue 16).

- "Standalone Code on the PowerPC," by Tim Nichols, and "Debugging on PowerPC," by Dave Falkenburg and Brian Topping, both in *develop*, issue 17 (March 1994). These articles are also on the March 1994 Developer CD (path—Dev.CD Mar 94:Reference Library:Periodicals:develop:develop Issue 17).

- Developer University PowerPC Boot Camp. A four-day workshop for developers wanting to learn how to port their 680x0 code to PowerPC. The course will be given in Cupertino, California, on April 11–14 and May 23–26. The course fee is \$1600. To register, contact DU by phone at 408-974-4897, by fax at 408-974-0544, or by AppleLink at DEVUNIV.

(both the data and the code) that constitute your Power Macintosh application. If you have additional data that you want to include in the data fork (for example, program serial numbers or data from the original 680x0 version of your application), you should place such information in a resource. It is possible to leave such information in the data fork, but doing so affects the performance improvements that the Power Macintosh brings to virtual memory.

The code-fragment resource (of type 'cfrg' and ID 0) in the resource fork is critical. Power Macintosh system software looks for this resource. If it does not find it, it assumes the application is a 680x0 application, causing the Segment Manager to load your application from the 'CODE' resources provided. If the code-fragment resource is present, system software reads it to learn several things about the application, including the type of instruction set used, the number of fragments present, the current and oldest acceptable version numbers (for import libraries), and the fragment's name.

But what if the user has a Power Macintosh computer at work and a 680x0 Macintosh computer at home and wants to use your application in both places? What if your application is on a removable cartridge or a hard disk that gets carried between both kinds of Macintosh computers? To solve such problems, you may want to deliver your application (or give the user an option to install it) as what Apple calls a "fat" application. As the figure on page 23 shows, a fat application will run correctly on both kinds of Macintosh computers. (The Process Manager on a 680x0 Macintosh computer doesn't look for the 'cfrg' resource and so loads your application from the 'CODE' resources.)

Before you object to giving your users an application that is twice the size of the one you

deliver today, notice that both the 680x0 and PowerPC versions of your code share the same set of resources. Because of this, a "fat" version of your application may not be as big as you think, and it will be easier for your customers to use and for you to document.

(You don't have to explain why your application works on some Macintosh computers but not others.) If you decide to create a version of your application that contains only PowerPC code, you should at least install a 680x0 'CODE' resource that displays a

dialog box explaining that your application runs only on a Power Macintosh computer.

The first part of this article has, I hope, given you an idea of how the Power Macintosh computers work. If, however, you're the person who has to figure out how

## More Than Just Faster Programs: How More Speed Can Make Programs Fundamentally Faster

You may be thinking, "You said that this is still a Macintosh—so why do I need to change how I write my applications? They'll run faster—I'm all in favor of that—but I don't see how that changes anything."

To answer that question, you need look no further than the Graphing Calculator application that ships with every Power Macintosh computer. (You can find it in the Apple menu.) You really must see this to believe it, but I'll try to describe a bit of this small (about 400K) application.

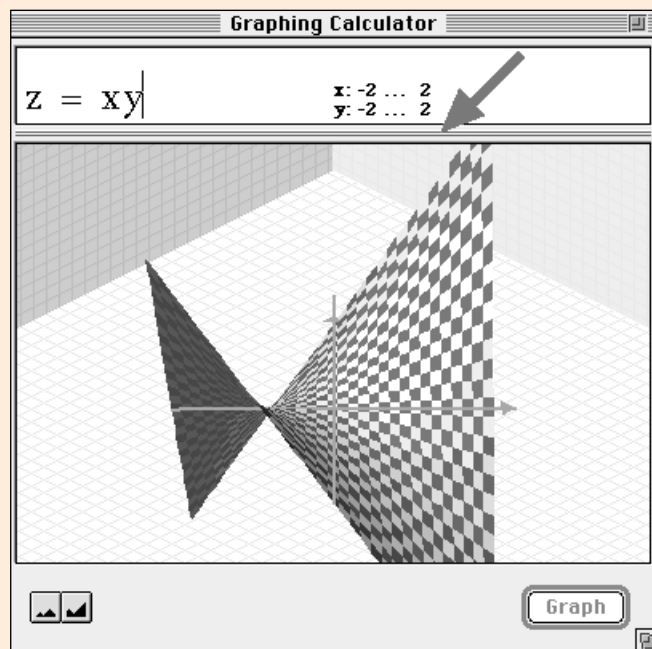
When you open the Graphing Calculator, you get a window with an upper and a lower pane. Type an expression into the upper pane, and the Graphing Calculator evaluates it and gives you an answer. If it's an equation of two or three variables, the calculator plots it for you.

In the screen shot below, I've typed in the simple equation  $z = xy$ , which gives me the 3-D graph shown below the equation. The twisted checkerboard surface represents the solution of the equation. What I *can't* show you is

that the graph is in color and that the checkered surface is rotating at several frames per second! Do you want to make the upper pane larger? Then grab the divider between the two panels (marked with an arrow) and drag it down. You see no dotted rectangles as you move the divider bar—the top and bottom panels grow and shrink, respectively, and the checkered surface keeps rotating!

Here's another example. When you enter the equation  $\sin x = x/10$  (see "Solving an equation" on page 25), the Graphing Calculator responds by graphing both  $y = \sin x$  and  $y = x/10$ . If you move the cursor near the vertical line on the right (see arrow), you can grab the line and visibly drag it to the right or left. The little box on the line stays on the sine curve, and the upper panel shows the  $x$  and  $y$  coordinates of the box. If that's not enough, when the box approaches an "interesting" place (a local maximum or minimum, for example), it jumps to that exact spot and makes a small click. In the screen shot on page 25, the box has jumped to the intersection of the two graphed equations—that is, one solution of the equation  $\sin x = x/10$ .

The screen shot "Manipulating an equation" is actually a composite of one equation,  $y = ax + ab$ , being manipulated. If you



Graphing calculator.



to convert an existing 680x0 application to native PowerPC code or how to write a new PowerPC application from scratch, there's more you need to know. (Actually, you should start reading *Inside Macintosh: PowerPC System Software* right now. It's available

from APDA, and it's on this month's Developer CD. See the "Resources" text box for details on this and other documentation and tutorial material.)

The final part of this article will cover the Mixed Mode Manager and some of the changes it

necessitates when you're writing PowerPC code. I'm pulling material from several sources (including interviews with several Apple engineers), so I hope that next month's installment will ease your initiation into the inner mysteries of the Power Macintosh platform. ♣

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information for developers of QuickTime applications.

- "Ten Tips for Game Developers" tells you some things you should know if you want to write games for the Macintosh—or even if you don't.

You also won't want to miss part 1 of the history of the dog-cow, Dave Johnson's column on why programmers program, and KON and BAL's typically difficult (but fun!) Puzzle Page. Check out all this and more on this month's edition of the Developer CD Series or on paper if you subscribe to *develop* in print.

The code described in *develop*, and all its back issues, are right there on the CD. So take advantage of this valuable resource—and please let us know at AppleLink address DEVELOP what we can do to make it even more valuable for you.

Caroline Rose  
Editor, develop

New Developer Notes From Apple

Developer notes provide product-specific technical information on new Macintosh computers and Apple Computer, Inc., imaging products. Unlike reference manuals and technical notes, they provide concise descriptions of hardware and software features that are unique to the new product; they're issued concurrently with the introduction of the new product; and they include information that's only relevant to a developer's needs. Preliminary

please turn to page 26

grab the term *a* (top equation) and drag it to the left, the Graphing

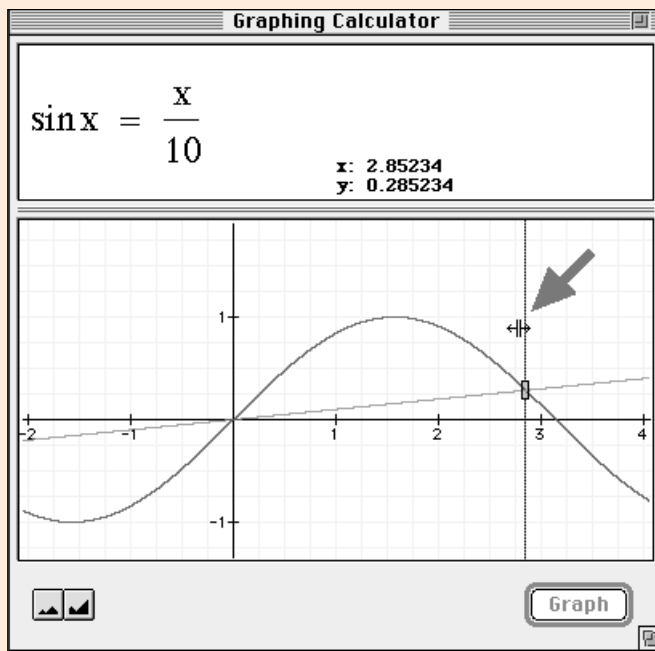
Calculator shows you how the equation is transformed—first, it

factors the *a* out (middle equation), then it moves it to the left side of the equal sign (bottom)!

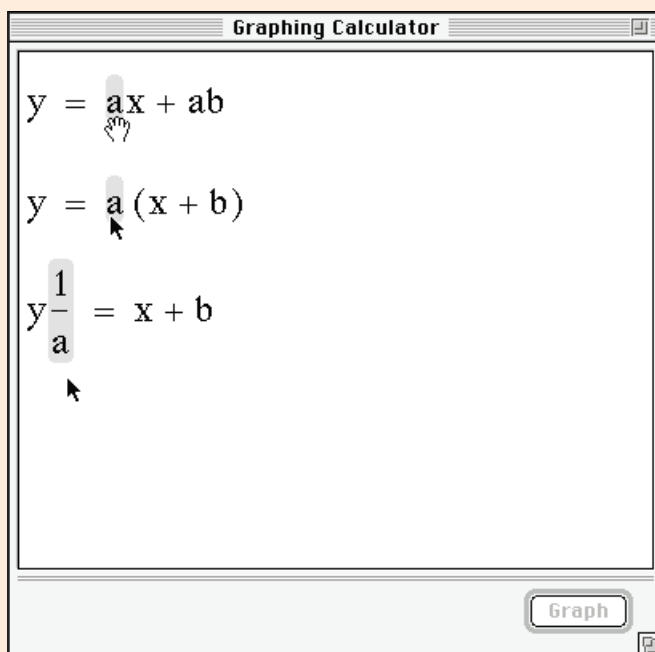
So what's the point? In two words: *direct manipulation*. A 680x0 version of this program exists, and it's a pain to use. Every time you try to drag something, the computer takes a second or more to respond, and your entire experience with this program is one of *slowness*. You forget what you're trying to do—all you can think about is waiting for the program to catch up with you.

The extra horsepower in the Power Macintosh computers doesn't just mean applications running faster. It also means grabbing a rendered 3-D object and turning it instead of pulling down a menu item named Rotation, reading the dialog box that asks, "Rotate by how many degrees?," typing in the number 72 (which may or may not be what you had in mind), and typing in a second or third guess when the first result isn't exactly what you want. It means strengthening users' perception that they are in control, that they are actually inspecting that 3-D object, not looking at a computer screen.

The most successful Power Macintosh applications will be the ones that connect users directly to the data. Grabbing something and moving it is a basic human action. It's intuitive; it's powerful; it gets results. Make good use of direct manipulation in your next software project, and your customers won't think of buying anything else.



Solving an equation.



Manipulating an equation.

## Human Interface

# Fluent Interfaces, Part Two: Ports

By Pete Bickford

Sometimes it seems that the world of computers is dominated by giants, huge corporations that threaten to crush any competitor in their paths. These Goliaths seem to have every advantage: well-staffed development teams, large-scale distribution, and seemingly endless resources to spend on marketing. When a company like that releases a product, it's virtually guaranteed a certain large percentage of the market. That's why it's so important for small developers to take note when a giant falls flat on its face.

In last month's column, I wrote about the importance of your program speaking the user's native tongue, whether it is English, German, Japanese, or another language—without compromises for the sake of technology. This month, I'll write about "speaking the user's language" from an interface perspective—and tell how not doing so cost one company millions and probably its best chance to own the Macintosh word-processing market.

## A Cautionary Tale

In 1987, several word processors vied for the top spot in the Macintosh market. Microsoft Word had a significant lead by then, but a host of others still threatened to close the gap. Nevertheless, Microsoft was worried by the impending entry of a newcomer—a company whose product had an iron grip on the DOS word-processing market. In fact, industry wags were speculating that this company would soon own the Macintosh market too.

When the Macintosh version of this product arrived, it sported a feature set comparable to the most advanced of the Macintosh offerings, compatibility with its DOS counterpart, and the full

support of arguably the most powerful company in word processing. It only had one problem: It was a Macintosh product with a DOS-flavored interface.

Sure, it had menus and icons and all that, but they never seemed like much more than window dressing. Some interface features were misimplemented; others had great liberties taken with them. Worst of all, the designers felt compelled to mimic all the strange quirks found in the DOS version, even when they made no sense on the Macintosh. For example, DOS computers of the time had no ability to show different fonts and typestyles on screen, requiring a view mode that showed the special characters that had to be embedded in the text to accomplish these tricks. The Macintosh had never had such problems, being fundamentally WYSIWYG ("What You See Is What You Get") since its inception. Nevertheless, the designers felt compelled to add a non-WYSIWYG mode to their Macintosh application so that Macintosh users could also share the joy of reading passages like "[Font Times][Size 12][Bold]This is a test[End Bold]".

Faced with such DOS-isms in what was supposed to be a Macintosh application, Macintosh users stayed away in droves. The product did not do well, and the company lost its single opportunity to unseat the not-yet-invulnerable Microsoft Word. Years later, this company has achieved considerable success with products customized to the Macintosh platform, and it now embraces new Apple technologies as a way of differentiating its products.

## Technology News

### New Developer Notes

*continued from page 25*

versions support the seeding of prototype products to developers who have non-disclosure agreements with Apple.

Developer notes are invaluable if you're designing hardware peripherals or software applications and need detailed technical

information in a timely manner. They're always made available in DocViewer format on the monthly Developer CD—both of the new notes are on the April 1994 System Software CD—as well as on paper through APDA. (See page 36 for APDA ordering information.)

Hot off the press this month, *Macintosh Developer Note Number 8* (APDA #R0566LL/A) focuses on Apple's new family of Power Macintosh computers, the first computers in the industry featur-

ing the new PowerPC micro-processor. This note provides detailed technical information on the Power Macintosh computer including new features, operating functions, design differences, compatibility issues, hardware expansion capabilities, and system software modifications.

Also new is the QuickTake 100 digital camera developer note describing Apple's innovative digital camera, a device that captures 24-bit images that can be downloaded, by serial cable, to

either a Macintosh computer running System 7.1 or later or an IBM PC compatible running Windows. The software component information in this note is essential if you are creating a Macintosh or Windows application to take advantage of the features of the QuickTake 100 camera. A software developer kit containing a disk and a hard-copy version of the developer note will soon be available from APDA. ♣

### When in Rome . . .

In all fairness, this company simply made the same mistake that hundreds of developers make each year: introducing a product for a foreign platform without first learning the platform's interface "language." In this case, this company's developers contented themselves with merely adding a few windows to what otherwise felt like a DOS program. Macintosh users, tough customers that they are, recognized this and refused to play along. After all, why spend hard-earned dollars on a program that doesn't seem to take their platform seriously?

Lest we appear arrogant, we should all remember that the same holds for any platform. Windows users expect software that is authentically Windows. Amiga users want software that feels as if it were created especially for the Amiga. No computer users like feeling that the version of software they're using is a cross-platform compromise or a least-common-denominator solution.

The sad truth is that users couldn't care less about the difficulties involved in moving a product from one platform to another. When you bring a product into a market, it is going to be judged by the standards set by the finest programs native to that market. If your program doesn't measure up, its days are numbered.

### Travel Guides to Foreign Platforms

To successfully move your program to a new computer platform, you need to master the same skills that experienced travelers have. First and foremost, you need to realize that the place you're going to has its own language, culture, and customs. It would be the height of arrogance to assume that the natives would gladly abandon all of these in exchange for the superior ones that you bring with you. Of course, this hasn't stopped all sorts of people from trying to "convert" the natives, but the market acceptance of this practice is decidedly mixed. Not a few of those who have tried it have had their heads handed to them as a result.

We're all experts in the culture (or computer platform) we grew up with, but learning how to get along in another requires some sort of study. One way to start is with a sort of "tour guide" that tells you the essentials such as how to say, "Hello," what the road signs mean, and which side of the street to drive on. Someone could make a killing publishing such tour guides for the major computing platforms. These guides should tell non-natives what the key interface elements are for the platform, point out differences in usage, and include a list of the interface do's and don'ts. For instance, a Macintosh/Windows tour guide would cover when to use "Exit" instead of "Quit," differences in alert icons, the relative importance of menu bars, and so on. Ideally, a tour guide would also provide insights into the philosophy at work behind a given interface. For example, in the Macintosh interface, it's important that the user not have to remember and type option settings. In straight UNIX, however, the aesthetic is almost totally reversed, with the keyboard receiving great importance.

Until such tour guides become available, developers should at least take it upon themselves to pick up the interface guidelines

book for their target platform. These will give you the item-by-item description of how interface elements are expected to operate in that environment. Pay particular attention to elements such as dialog boxes and windows that may look the same, but differ subtly in the way they are used.

You should spend time immersing yourself in the new platform. See how various applications work, read the trade magazines, and talk to other users. Eventually, you'll get a sense for the overall "feel" of the platform, and you'll be able to incorporate this into the products you design for it.

### Coding for Cross-Platform Products

There has been much talk of programmers being able someday to change a compiler switch or two, link in the appropriate library of interface objects, and then automatically generate applications for any platform. This sounds great, but it only works if you assume that all platforms are basically similar, and differ primarily in their graphic style. Unfortunately, that just ain't the way it is.

A better approach is to isolate the parts of your program that manage the human interface from the parts that do the behind-the-scenes work. This gives you the flexibility to design an interface that's a natural fit for the users of a given platform, while still reusing the majority of your most critical code. Not so coincidentally, this approach also makes it easier to tackle localization issues, since it helps isolate the parts of your program that are based on a given language or culture.

### Beware the Least Common Denominator

The greatest temptation in developing cross-platform software is to blindly "port" the code from one platform to the next, stripping out any interface feature that isn't common to each platform. This strategy worked for about 18 minutes back in 1986 when there were no other choices, and gave Macintosh users a lot of really ugly programs with one window and screens full of Chicago type. The day when developers could get away with this sort of thing is long since past. Being successful now relies on making the most of any platform your software runs on. Remember: The best "port" is the one that your customers swear was written on their platform first.

*Till next time,  
Doc*

*AppleLink: THE.DOKTOR*

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*Pete Bickford is a member of the Apple Business Systems human interface team.*

## CD Highlights

*continued from page 18*

computers. Finally, it provides profiles for three new Apple products, the PowerBook 270c, the Apple Multiple Scan 17 Display, and the Apple Multiple Scan 20 Display.

### Developer Notes Update

This month's CD includes files for two important new Developer Notes. The first describes Apple's new family of Power Macintosh computers, the second the new QuickTake 100 Digital Camera. For more information, see "New Developer Notes From Apple" on page 25 of this issue.

### DiskFiller

This little utility allows you to fill any mounted disk instantly, which is incredibly useful when you want to test under low-disk-space conditions. You no longer have to duplicate file after file to fill your hard disk. It creates a file on the root level of the filled disk called Filler. To free the space, you simply throw away the Filler file.

### Installer 4.0GM SDK

Installer 4.0 provides a mechanism for installing software on both 680x0 and PowerPC processor-based Macintosh systems. Details about the new Installer's features appear in "New Installer Offers Many New Features" on page 17.

### MacsBug 6.5d6

This is the latest nonfinal version of MacsBug, Apple's 68K object-level debugger. This version now supports Macintosh computers with multibit displays, such as the PowerBook 165c and 180c computers. It has support for the Modern Memory Manager, introduced with the new Power Macintosh computers. The new version also supports disassembling and breaking on selector-based A-trap calls.

### Network Software Installer 1.4.2

You can use Network Software Installer 1.4.2 to install the following networking products:

- Update to AppleTalk version 58.1.2
- Network Control Panel version 3.0.2
- AppleTalk Internet Router 2.0 (requires router installation disk)
- Update to EtherTalk version 2.5.6
- Update to Ethernet driver version 1.1 for Apple Ethernet NB Card
- Update to Ethernet driver version 6.0.5 for Apple EtherTalk NB Card
- Update to Ethernet driver version 1.1 for Apple Ethernet NB Twisted-Pair Card
- Update to Ethernet driver version 1.1 for the Apple Ethernet LC Card
- Update to Ethernet driver version 1.1 for Macintosh Quadra 700, 800, 900, and 950 and Centris 610 and 650 computers with built-in Ethernet
- Ethernet driver version 1.0.1 for Macintosh Quadra 840AV and Centris 660AV computers
- Added support for Ethernet driver version 1.1 for Apple Ethernet LC Twisted-Pair Card
- Added support for Ethernet driver version 1.1 for Apple Ethernet CS Twisted-Pair/Coaxial/AAUI Card
- Update to TokenTalk version 2.5.6
- Token Ring control panel version 1.0.1
- Token Ring driver version 2.5.2 for the TokenTalk NB and Token Ring 4/16 Cards
- It's supported by Apple Computer.
- It allows an application process to be broken into simple subprocesses that proceed concurrently in the same overall application context.
- It allows both cooperative and pre-emptive threads in 680x0 software.
- It allows only cooperative threads in native PowerPC software.
- It provides an easy-to-use programming interface.
- It performs fast context switch times and allows you to pass parameters on the stack. (It doesn't use BlockMove on thread stacks as did the previous Threads library.)
- It allows threads to have custom in/out context handlers.
- It supports native PowerPC software!

You'll also find useful sample code, sample libraries, and debugging tools in the Thread Manager 2.0 folder. Thread Manager 2.0 runs on models from the Macintosh Plus through the Power Macintosh computer running any version of System 7.

### Coming Next Month

In addition to a new *Apple Publications Style Guide* and other things inside, the May Tool Chest CD should also feature a new outside. Stay tuned....

*Alex Dosber,  
Developer CD Leader*

See the ReadMe file for details.

### Thread Manager Extension 2.0

The Thread Manager is a System 7 extension that allows applications to make use of multithreading on both 680x0 and PowerPC processor-based Macintosh computers.

In addition to being a real, live Macintosh Toolbox Manager, with A-traps and everything, and shipping with documentation that's less than 2 inches thick, the Thread Manager 2.0 offers these features:

# Business & Marketing

## Special Market Report

### Power Macintosh Market Outlook

#### Rapid Growth of Installed Base Should Create Developer Opportunities

By Kris Newby

After a decade of steady Macintosh evolution, the introduction of the Power Macintosh computer ushers in a dramatic new set of market dynamics for you to ponder. In this article, we hope to convince you that the best time to support this new platform is *now*, and we back up this premise with market analysis from experts both inside and outside of Apple Computer, Inc. You'll get their best estimates on how the Macintosh installed base will change with Apple's new "open technology" strategy and what market opportunities the new Power Macintosh platform will create for you.

One perspective is presented by Pieter Hartsook, a respected personal computer market analyst and the editor of *The Hartsook Letter*; based in Alameda, California. Hartsook, a ten-year Apple watcher, supplied us with Macintosh market projections based on his time-tested forecasting model and discussions with Apple insiders, Macintosh developers, distributors, and customers. (His track record is good—he points out that his 1992 worldwide Macintosh shipment estimates were within five percent of actual shipments.)

The Apple perspective is presented by Michael Mace, Apple's internal competitive analysis

expert. In keeping with Apple's policy of not releasing product forecasts, Michael instead offers some qualitative information on the Power Macintosh market and how this product line fits into Apple's overall product strategy.

#### Why Support the Power Macintosh Platform?

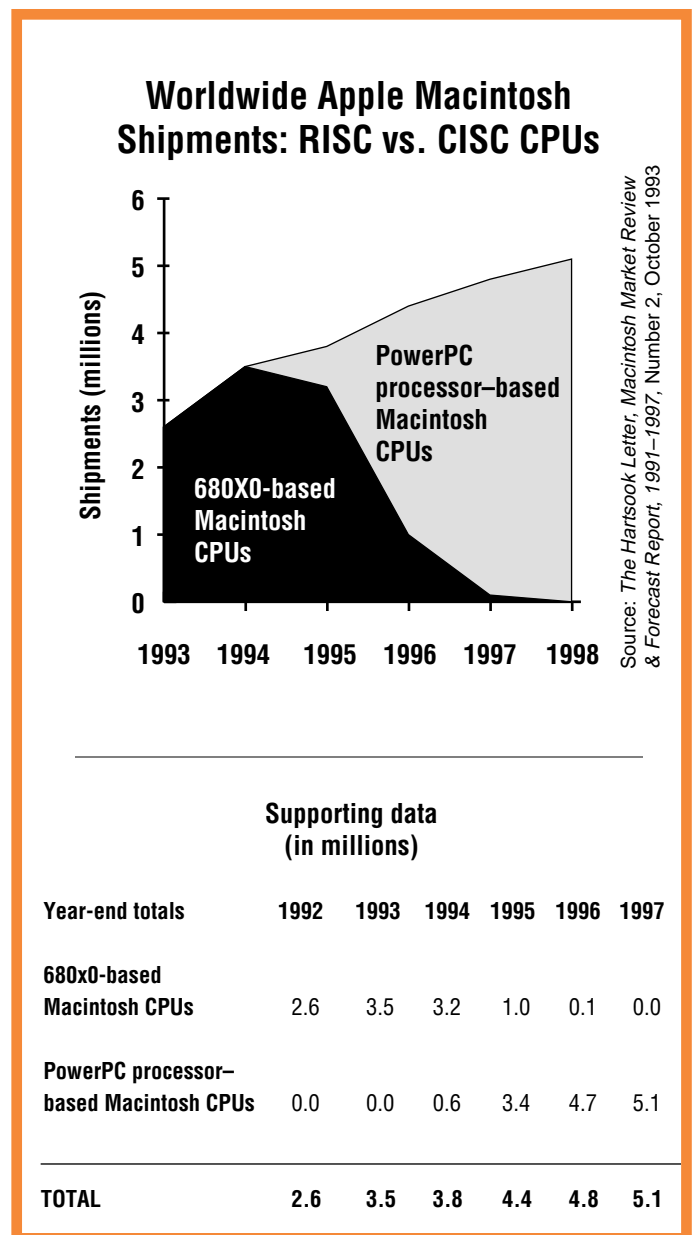
The introduction of the Power Macintosh computer should create both short-term and long-term opportunities for you.

Initially, Apple's aggressive campaign to upgrade the Macintosh installed base will create a strong demand for native Power Macintosh applications and hardware upgrades. (A native application is one that has been recompiled for the PowerPC chip. Native applications take full advantage of the superior speed of PowerPC technology.) The first developers on the market with native applications and hardware upgrades will benefit from less competition and introduction-time press coverage and advertising.

Over time, Apple will make a strategic shift to the RISC (reduced instruction set computer) platform and continue to advance the Macintosh operating system. The overall market for third-party Macintosh products should grow significantly as "power users" from other platforms move over to Apple's more

attractive price/performance Power Macintosh systems. And with the introduction of Macin-

tosh "compatibles" and Macintosh operating system emulation software (software that enables



*Editor's note: In all tables, year-end totals are plotted at the first of the following year.*

Macintosh applications to run on top of Sun, HP, and other popular servers), the Macintosh software market should grow even more. Read on for Pieter Hartsook's numeric estimates of how large this market may become and Apple opinions on which vertical and global markets will be most receptive to native Power Macintosh products.

**Apple's Installed Base Poised for Rapid Growth**

Overall, Hartsook's analysis is consistent with Apple's PowerPC strategy: The installed base of Power Macintosh computers should grow rapidly in the 1990s as a result of an aggressive upgrade strategy, attractive price/performance, and an abundance of native Power Macintosh applications. Within just a few years, almost all Macintosh computers manufactured by Apple will use a PowerPC RISC micro-processor instead of today's 680x0 CISC (complex instruction

set computer) chip. (See "Worldwide Apple Macintosh Shipments: RISC vs. CISC CPUs" on page 29.)

"In three years, about half of the installed base of Macintosh computers will be PowerPC processor-based CPUs," says Hartsook. "While this may seem like a rapid transition, it's actually slower than the time it took for customers to move from System 6 to 7." (See "Worldwide Apple Macintosh Installed Base, by Processor" on this page, and note that these estimates include PowerPC upgrades and exclude retired 680x0-based CPUs.)

Apple's Michael Mace thinks Hartsook's numbers may even be on the low side: "Apple will be the first-to-market with a mass-market RISC personal computer. Hartsook's estimate is good, but if anything we think his numbers are conservative. We expect a lot more growth in overall Macintosh shipments than he expects by 1997. Even by the end of 1994, we're very likely to ship more RISC-based computers than the entire workstation industry."

**"Macintosh Compatibles" Will Generate Incremental Software Sales**

In a recent speech to shareholders, Apple President Michael Spindler said that Apple is actively exploring the possibility of licensing the Power Macintosh platform to other computer manufacturers.

This move will likely be a boon to you. With other companies selling computers that run the Macintosh operating system, there will be a significant increase in the number of potential Macintosh software customers, possibly more than 3 million new prospects by 1997. (See "Worldwide Apple Macintosh Shipments: Apple Macintosh and Third-Party 'Compatible' CPUs" on page 31.)

Why is Apple departing from the past strategy of keeping its

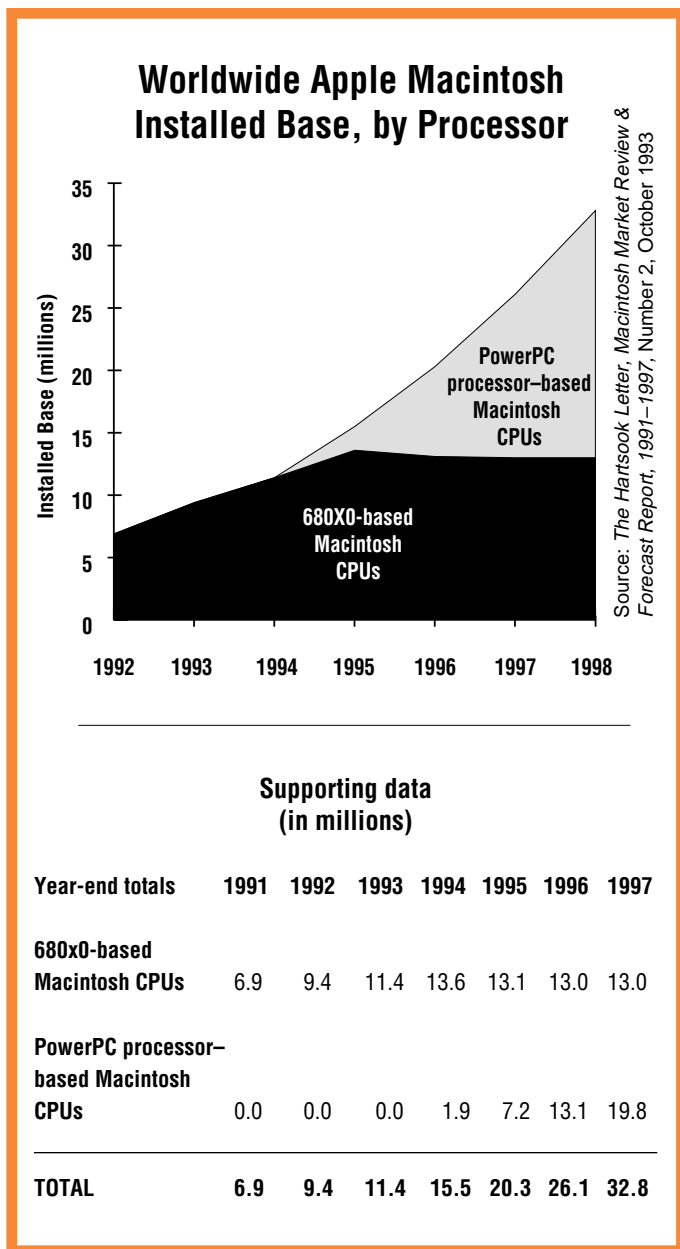
technology proprietary? Mace explains, "What we learned from the first ten years of Macintosh is that you can't completely change the world without setting standards, and you can't set standards without partners. We're going to try to make Power Macintosh the next computing standard by sharing it. It's a strategy to increase our market share and open up the platform so lots of people can innovate. Apple will continue to make computers, but customers will have more choice; and the competition between Macintosh licensees will keep prices low and push innovation along rapidly."

Hartsook thinks that Apple's move to license the Power Macintosh operating system is a strategy that will help Apple break through the 15 percent market-share barrier: "Licensing the Mac OS will open new channels for Apple, since its products are currently sold through a very small segment—only 10 to 20 percent—of the total reseller/computer dealer channel. If Apple licenses its technology to a Compaq, Dell, or AST, it will then be able to expand its channels, allowing the Macintosh market share to go as high as 25 percent within three years."

**Model Purchasing Trends to Continue**

In 1993 roughly half of all Macintosh shipments were entry-level Macintosh LC and Performa computers, a third were mid-range/high-end Macintosh Quadra systems, and the remainder were portables, as shown in the pie chart "Breakdown of Macintosh Model Sales, 1993" on page 31. Hartsook expects this purchasing trend to continue into the 1990s as PowerPC processors are incorporated into similarly positioned product families.

The ratios of system shipments in 1993 can be used to



project future Power Macintosh shipments. Annual shipment estimates are shown in the graph "Worldwide Apple Macintosh Shipments, by Processor Type" on page 32. (See "PowerPC Processors—What's New" on page 33 for details on specific processors.)

**Defection of Intel "Power Users" Should Expand Macintosh Base**

Customer adoption of the Power Macintosh platform should increase as second-generation PowerPC processors are

incorporated into Apple's product line. If the sales of your products are linked to sales of specific Apple product models, you'll want to make sure native versions of your applications are on the retail shelves when customers begin to upgrade to these models. What follows is a timetable of when specific customer groups are likely to move over to the Power Macintosh.

The first wave of Power Macintosh customers should come from Apple's loyal customer base, as shown in the figure "Customer Transition to the Power Macintosh

Platform" on page 34. The next category of first-generation buyers should be the same type of customers who buy Macintosh Quadra computers. These are users in market segments such as technical analysis, graphics, publishing, and prepress; they aren't price-sensitive, and they usually buy all the processing power they can get their hands on.

PowerBook computers built with the more economical and power-efficient PowerPC 603 processors will motivate the next wave of customers to buy in early 1995. When the 603 processors are built into less-expensive computer models, LC and Performa buyers should shift to the new platform. Then, as the "mainframe-on-a-desk" 620 processors become available, workstation and server prospects should move over. (For details on specific processors, see "PowerPC Processors—What's New" on page 32.)

Hartsook says, "Historically Apple has sold to the same loyal customers over and over again, resulting in a trickle-down market expansion. Every two or three years when a new model comes out, existing customers buy one and pass their old

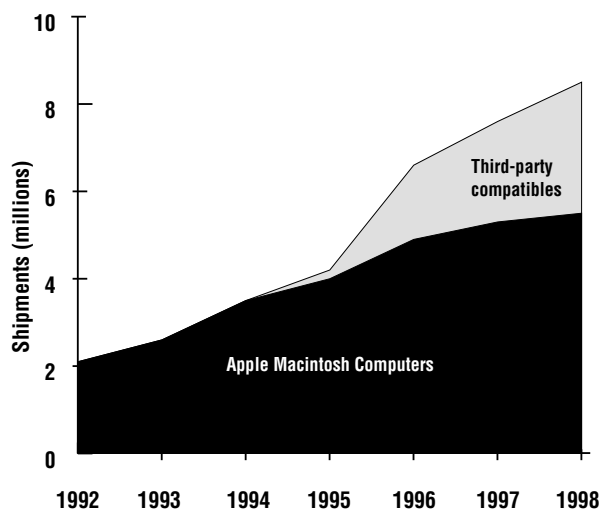
computers on to others. Then the cycle repeats itself when these new users outgrow the hand-me-down computers. The attractive price and performance of the Power Macintosh should allow Apple to expand beyond that rate of growth.

"Apple's first big opportunity to do this will come from Windows and Intel PC 'power users.' These power users work with computationally demanding software that pushes the limits of the hardware. These users are more concerned about performance than the name on the box, and I feel they'll start migrating over from the Intel side."

What's more, these users will be able to preserve their investments in Windows software because SoftWindows, Insignia Solutions' PC-compatibility solution, will be shipping with many Power Macintosh configurations.

SoftWindows is a software solution that offers Power Macintosh customers performance equivalent to that of today's Intel 386 or 486 computers, depending on their system configuration. It provides full MS-DOS Windows compatibility in

**Worldwide Apple Macintosh Shipments: Apple Macintosh and Third-Party "Compatible" CPUs**

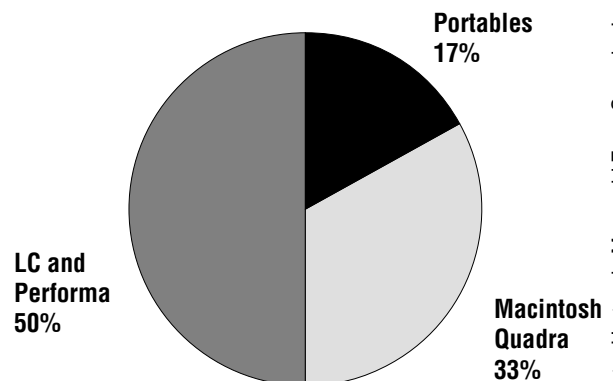


Source: The Hartsook Letter, Macintosh Market Review & Forecast Report, 1991-1997, Number 3, February 1994

**Supporting data (in millions)**

Year-end totals	1991	1992	1993	1994	1995	1996	1997
Apple Macintosh computers	2.1	2.6	3.5	4.0	4.9	5.3	5.5
Third-party compatibles	0.0	0.0	0.0	0.2	1.7	2.3	3.0
<b>TOTAL</b>	<b>2.1</b>	<b>2.6</b>	<b>3.5</b>	<b>4.2</b>	<b>6.6</b>	<b>7.6</b>	<b>8.5</b>

**Breakdown of Macintosh Model Sales, 1993**



Source: Pieter Hartsook, Macworld Expo Speech, January 1994

standard mode, as well as built-in PC network support. (A complete licensed copy of Windows 3.1 and MS-DOS forms an integral part of SoftWindows, enabling Insignia's technology product to support all current and future versions of Windows applications.)

It's also compatible with the full range of PC devices and systems, including COM and LPT ports, floppy drives, memory systems, video displays, networks, and CD-ROMs.

**Publishing and Technical Markets to "Go Native" First**

What types of customers will buy the most Power Macintosh

computers and native applications? Apple anticipates that the following market categories should be clamoring for native Power Macintosh applications in 1994 and 1995. Apple will focus its marketing efforts on these groups during this time.

- **Publishing.** This large Apple market is estimated to account for 38 percent of the total Macintosh market, based on Apple registration-card data. In high-end publishing, graphic design, and pre-press production, users are constrained by the current hardware. Purchasing Power Macintosh computers will provide them with instant productivity increases.

Most leading publishing and graphics product developers are

creating native versions that will be available at the Power Macintosh introduction, including Adobe Illustrator, Adobe Photoshop, Aldus FreeHand, Aldus PageMaker, FrameMaker, and QuarkXpress. Many of these high-end users are expected to upgrade soon after the Power Macintosh introduction.

- **Technical markets.** The PowerPC processors' floating-point capability will make the Power Macintosh attractive to customers who use computer-aided design, scientific analysis, simulation, and other processor-intensive applications. (A recent Apple trial resulted in a floating-point-only test application running 15 times faster on a 601-based Power Macintosh than it did on a Quadra 840; but keep in mind that this was only a test application, and that very few real applications are floating-point-only.)

These buyers aren't price-sensitive, and they tend to buy the fastest computer and whizziest software on the market, regardless of brand. Developers predict that the Power Macintosh will make great inroads into the technical market; and they also claim it will change the competitive landscape for the better.

Around introduction, native versions of technical products such as ArchiCAD, ITEDO IsoDraw, MiniCad 5, MultiFrame 3D, and HiQ should be shipping.

- **Business productivity.** Look for native versions of mainstream business applications such as Microsoft Office, ClarisWorks, and WordPerfect shipping soon after introduction. Speed is not a driving factor in this market, but as developers start creating native business productivity applications that take advantage of new operating system technologies, Power Macintosh sales are expected to grow rapidly.

"We'll see entirely new types of business applications spring up as

developers start taking advantage of AV technologies like the Geo-Port telecommunications architecture, intelligent interface capabilities, and collaboration," says Jim Gable, Power Macintosh product manager. "With PlainTalk speech recognition and text-to-speech present on all Power Macintosh computers, it will be possible to create compelling business solutions that have never been done before."

- **Learning.** With 50 percent of U.S. Macintosh unit shipments going into the education channel in 1993, the education market segment should be a strong purchaser of Power Macintosh computers.

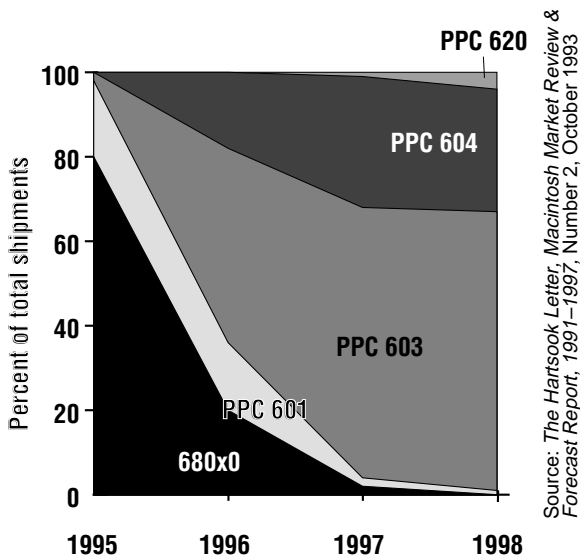
In addition, Apple's leadership in multimedia technologies should give Apple a competitive lead in this market. Multimedia products such as Adobe Premiere, Infini-D, Virtus Walk-Through, Electric Image Animation System, and VideoFusion will be shipping on or soon after the Power Macintosh introduction. One caveat: Because of the traditionally long sales cycles in the education channel, sales of low-end models may lag six months to a year behind their introduction.

**The Power Macintosh Competitive Advantage**

In the 1990s, Power Macintosh systems will be battling for market share against two main competitors: Intel-based systems and PowerPC processor-based systems from other computer manufacturers. In deciding on which platforms to allocate your precious development resources, you not only have to consider which platform will keep your business going today, but which will take you where you want to go in the next decade.

In the short term, Intel systems will have inherent processor limitations and many of the other PowerPC processor-based

**Worldwide Apple Macintosh Shipments, by Processor Type**



Source: The Hartsock Letter, Macintosh Market Review & Forecast Report, 1991-1997, Number 2, October 1993



computers will lack easy-to-use, mainstream operating systems. Apple is trying to capitalize on this two-to-three-year head start and strategically position itself to become the leading mass-market computing platform.

Pieter Hartsook gives Apple the advantage out of the starting gate. "Initially Apple will have a competitive advantage in the PowerPC system market, because backward compatibility with current Macintosh systems provides a potential market of almost 12 million eager-to-upgrade customers. Also, development environments like the Macintosh on RISC SDK and Metrowerks CodeWarrior shipped even before the first Power Macintosh computers were introduced, so we're going to see a large number of native applications on that platform."

Short-term competitors of the Power Macintosh line will be Pentium-based computers. While these systems should be competitive during 1994, the fact that this processor is old bi-CMOS technology will make it difficult for these systems to compete with PowerPC systems after this time. (See the white paper *PowerPC Technology—The Power Behind the Next Generation of Macintosh Systems* on the March 1994 installment of the Developer CD Series.)

According to Hartsook, "Pentium chips, as they exist today, have power limitations, heat dissipation problems, and more transistors than PowerPC chips, so they'll be comparatively expensive to manufacture. In fact, the current Pentiums just won't be competitive by the end of this year. We're expecting to see Macintosh systems with 120 MHz implementations of the 601; the Pentium systems may be priced competitively with these Macintosh systems, but they're going to be left in the dust as the clock speeds increase in the 603 and 604 generations."

Michael Mace reiterates Hartsook's opinions: "Eighteen months down the road, we'll open up a substantial price/performance gap between Intel-based products and ours."

In addition to Intel, Apple's other major competitors will most likely be RISC-based computers designed by other companies, including computers based on the PowerPC Reference Platform (PReP) Specification Guide. (PReP is a set of guidelines, endorsed by IBM and other vendors, for designing computers that use PowerPC microprocessors.)

Mace says, "PReP is only an alpha specification, and it's so vague that there's no guarantee a particular PReP-compatible computer will be able to use PReP-compatible expansion cards or even run a PReP-compatible operating system. We're hoping to work with IBM to refine the PReP specification into something tangible enough that we could move the Mac OS to it, but for the moment the only way to run the Mac OS will be by licensing Apple's Power Macintosh computer design. Any other RISC computer—even IBM's PowerPC computers—will be stuck running non-mass-market operating systems like NT and OS/2."

While IBM may deliver PowerPC systems by mid-1994, the important question is, will a large selection of native business applications be available on that platform at that time? Windows NT will be ready at the first customer ship date for IBM's Personal Power Systems PCs, but Hartsook doubts that there will be many applications shipping. "Don't expect a shelf full of native PowerPC NT applications any time soon," says Hartsook.

In contrast, Brian Mellea, Apple's Power Macintosh evangelist, expects more than 100 Power Macintosh mainstream native

applications to be available near product launch and hundreds more by the end of 1994. And with thousands of compatible 680x0 applications that can also run on Power Macintosh computers in emulation mode, there will be an abundance of software solutions available to a broad range of customers.

By the end of 1996, as more applications become available for the non-Macintosh PowerPC operating systems, Hartsook sees Apple competing on a more level playing field. "Although Apple will most likely end up with a smaller slice of the PowerPC pie, the pie will be growing rapidly as customers begin to abandon the Intel platform in favor of this equally standard, higher-performance, and lower-cost solution." And this is good news for developers—you'll be able to sell products to the entire pie.

So what about future competitive products that could threaten Apple's lead? (For example, Microsoft's Chicago, the next version of Windows, is expected to ship early next year.) Conventional wisdom says that Apple still has a lead in several areas and it will be hard for anyone to catch up—Apple is first on the shelves with a mass-market RISC computer, an abundance of native and 680x0-based software solutions, and a rich, flexible system architecture that allows developers to create great third-party products.

Mace elaborates, "Chicago is written mostly in x86 assembly code, so even Microsoft says it won't be ported to RISC. By the time our competitors get a mainstream operating system on RISC, the Power Macintosh standard will be well entrenched, and we'll be bringing out a lot of new

## PowerPC Processors— What's New

- More efficient overall design
- More processing per cycle
- Better memory handling
- Faster floating-point capability
- Smarter instruction handling

PowerPC 601	<ul style="list-style-type: none"> <li>• Faster than fastest 680x0</li> <li>• Equals or exceeds Pentium performance</li> </ul>
PowerPC 603	<ul style="list-style-type: none"> <li>• Ideal for portables and entry-level systems</li> <li>• 601 performance</li> <li>• New architecture (three instructions per clock cycle)</li> <li>• Reduced power consumption</li> <li>• Smaller, less expensive</li> </ul>
PowerPC 604	<ul style="list-style-type: none"> <li>• Ideal for mid-range to high-end systems</li> <li>• Two to three times faster than 601 and Pentium processors</li> </ul>
PowerPC 620	<ul style="list-style-type: none"> <li>• Ideal for workstation/server market</li> <li>• Four to six times faster than 601 and Pentium processors</li> </ul>

technologies to increase our lead.”

### **Development Opportunities**

Historically, when a platform changes, development opportunities arise, and this is certainly the case with the Power Macintosh transition. Here are some specific opportunities for systems integrators, application developers, and hardware developers.

- *For systems integrators.* The entry of third-party Macintosh compatibles should increase the Macintosh market size substantially enough to make it more attractive to systems integrators. The availability of Macintosh operating system emulators should provide these developers with the opportunity to integrate mainstream Macintosh applications into the focused software solutions that they create for workstations based on the UNIX operating system.

- *For application developers.* “With the technological leap of PowerPC systems, there’s an opportunity to create something radically new—not just faster

applications, but breakthrough applications that capitalize on collaboration, AV, and intelligent interface technologies,” says Brian Mellea, Apple’s Power Macintosh evangelist.

Hartsook adds, “I don’t think we’re going to see this kind of innovation come out of one of the big, established software developers, because their investment in established code creates too much inertia. It’s going to be the small start-up companies that don’t have existing products to support that are going to say, ‘We were thinking about doing something for a Silicon Graphics Indigo, but we could do the same thing on a \$2,000 machine and sell a lot more copies.’”

A second area of opportunity is in the “pushing the hardware envelope” category of applications, says Hartsook. “Products like Adobe Photoshop and Fractal Design Painter run like molasses in January on CISC hardware. By the second generation of Power Macintosh applications, the hardware shackles will be removed and developers will be limited

only by their imaginations, not their hardware.”

- *For hardware developers.* The new Power Macintosh platform should create a short-term opportunity for hardware developers. Developers such as DayStar Digital will be able to capitalize on 680x0 users who want to purchase third-party upgrade boards for their computers. In the long term, new operating technologies coupled with the new hardware will create new opportunities for products like intelligent, integrated telephony peripherals and mass-market digital image input devices.

### **Global Opportunities**

With non-U.S. product shipments accounting for almost half of Apple’s total sales, the global Power Macintosh market is important. Hartsook thinks that countries like Germany, France, and Japan, which already buy large quantities of Macintosh computers, should be very receptive to Power Macintosh computers. (See the article “PowerPC to Flood Market” in the August 1993 issue of *Apple Directions* for his

breakdown of European, Pacific, and U.S. Power Macintosh sales in the next three years.) In this section, we’ve summarized relevant global market information that should help you formulate localization plans for your native Power Macintosh applications.

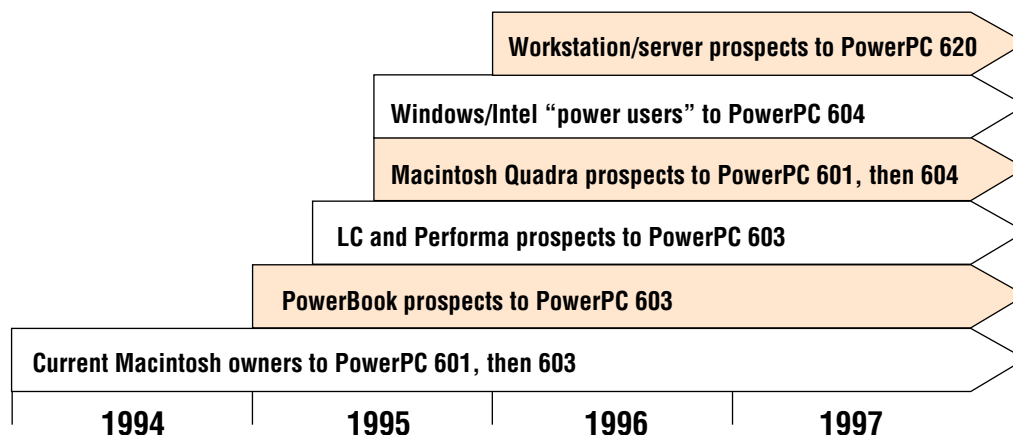
- *Europe.* Apple is launching a focused Power Macintosh marketing campaign in Europe and estimates that European sales will account for 22 percent of Power Macintosh shipments in 1994. In Europe the publishing market is extremely large, with segments like printing and graphic design capturing well over 50 percent of many individual country markets.

- *Japan.* Japan is Apple’s second largest market after the U.S., and Apple computers are the second most popular computer behind NEC, with a market share last year of 13.4 percent according to International Data Corporation. This year Apple Japan expects to grow that market share to 20 percent.

Pat Kirkish, market development manager for Apple’s Pacific

## **Customer Transition to the Power Macintosh Platform**

When Specific Customer Types Are Likely to Begin Upgrading



Source: Pieter Hartsook, Macworld Expo Speech, January 1994

region, attributes Apple's success in Japan to several factors. "Apple is the leading innovator in the Japanese computer industry. We were first in the marketplace with a fully localized Japanese graphical user interface and with laser printing technology. This has ignited our growth in the graphics and business segments, and positioned our products among the younger generation as trendy status symbols. We're anticipating that Japan will transition to the Power Macintosh faster than any other market. Our efforts will be focused on expanding DTP, general business, and scientific/engineering markets."

(See "Power Macintosh in Japan" on this page for important advice on marketing native applications in Japan.)

- *International English markets: UK, Canada, Australia, New Zealand, Singapore, Hong Kong, Malaysia, India, and more.*

Developers should note that there are strong markets for English-language products around the world. If you haven't set up distribution for your products in these markets, you're missing sales opportunities.

- *Far East Markets: Hong Kong, Singapore, China, Taiwan, Korea, Thailand, and more.* Of all emerging markets, Far East markets are perhaps the most exciting, with unit shipments growing more than 50 percent last year across the region, and an existing installed base of more than 200,000 Macintosh computers. Of the 100,000 Macintosh computers that Apple Far East is estimated to sell in 1994, more than 25 percent of them should be PowerPC processor-based. Apple will be delivering simplified and traditional Chinese, Korean, and Thai operating systems within weeks of the English-language Power Macintosh operating system. In addition, the Chinese

Language Kit, which takes advantage of WorldScript technology, will allow Apple to support Chinese-speaking Power Macintosh customers in markets such as the U.S., Canada, and Australia. There are already 12 major applications localized for Chinese-speaking markets, and several more are under development.

- *Latin America:* This market is growing fast in several areas. There's demand for entry-level productivity applications and for high-end publishing, graphics, technical, and higher education

applications. Apple Pacific is making a concerted effort to expand Macintosh sales throughout this region, especially in Mexico, where a new sales office was established last year. With the passage of the NAFTA treaty, computer product tariffs between the U.S. and Mexico are dropping quickly. Also, stronger anti-piracy laws are being enacted, and this should create increased demand for Spanish-localized software. Demand for Macintosh products in Chile, Venezuela, Columbia, and Argentina also continues to

grow, and in Brazil, Apple has just established extensive new distribution channels. Watch for the first Macworld Brazil this April, in São Paulo.

### **Power Macintosh and Apple's Overall Strategy**

All in all, Hartsook predicts that Apple's strategy to move to PowerPC technology will be a successful one. He summarizes his advice to Apple in making this transition: "Apple's survival is dependent on how well they upgrade their installed base by maintaining

## **Power Macintosh in Japan**

Apple continues to experience phenomenal growth in Japan. In spite of the weak Japanese economy, the demand for Apple products there seems insatiable. The introduction of Power Macintosh should only fuel this market's explosive growth. As a developer, you can't afford to overlook this market. To summarize Apple's unique position in Japan:

- Apple's market share in Japan has risen from 5 percent in 1991, to 8 percent in 1992, to 13.4 percent in 1993. In 1994, Apple expects to expand that share to 20 percent.

- Apple expects to sell 500,000 Macintosh computers in Japan during the 1994 fiscal year that ends in September.

- About half of all Macintosh computers sold in Japan are mid-range and high-end machines.

- Power Macintosh will be introduced early in April in Japan; for the remainder of 1994, about half of all Macintosh computers sold should be PowerPC processor-based. That means more than 100,000 Power Macintosh computers should be sold by the end of September and more than 150,000 by the end of the calendar year. This would make Apple the market leader in RISC-based technology in Japan.

Apple Japan estimates that about 50 PowerPC processor-native, Japanese-language applications will be shipping within weeks of the April introduction. Applications will be available in almost all categories (graphics, DTP, utilities, business). The most under-represented categories are entertainment and science/engineering.

As in the United States, Apple Japan has a number of co-marketing plans for developers with PowerPC accelerated native applications. A CD containing

Japanese native application demos will be included with every Power Macintosh shipped to Japan. (To find out how you can be included in the next version of this CD, send an AppleLink message to INOUE1). A roadshow and press events are also planned.

Apple Japan has also prepared two box stickers that allow developers to advertise PowerPC processor-compatible and accelerated software. The importance of including these stickers on your product boxes should not be underestimated. Japanese buyers tend to be very particular when it comes to buying the latest technology. Even owners of 680x0-based Macintosh computers are likely to avoid buying software that doesn't have a native version available.

Apple Japan's "Power Application" sticker is for native applications, and is equivalent to the "Accelerated for PowerPC" sticker being used in other markets. The abbreviation of this term, "Power App," is pronounced "Power Up" in Japan, and means "improved power."

The "Power Macintosh Taiou" sticker means "works on the Power Macintosh," and should be used for Power Macintosh-compatible applications. This sticker is especially important if you want to avoid a sales slowdown of your 680x0 applications while customers await new versions. Also, make certain that you refer to your native applications as "Power Applications," and reserve the word "taiou" for 680x0-compatible applications only. Your Japanese translators may want to use the word "taiou" to describe an application written for PowerPC; however, Apple Japan is deliberately using this word to mean "Power Macintosh-compatible."

—Pat Kirkish and Richard Sprague

compatibility short-term, then in the long run, how well they comply with industry standards and license their operating system.”

Michael Mace puts the move to the Power Macintosh into context with Apple’s overall strategy.

“Power Macintosh is really exciting, but what developers really need to understand is that it’s only a piece of Apple’s overall strategy. We’re continuing with our long-term priority of orches-

trating hardware and software so they play well together—this is, after all, one of the key advantages of Apple. Developers should note that there’s another revolution coming on the software side. [Editor’s note: See this issue’s *Strategy Mosaic* on page 1 for more details on Apple’s four-part development strategy.] Together, these changes should help make Apple *the* industry-standard platform for innovation.” ♣

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