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AOCE: Apple's Architecture for Collaborative Computing

By David Gleason

System 7 just keeps getting better. Apple released the new system-software foundation in 1991 with the intention of continuing to expand and enhance it. As part of that strategy, Apple released QuickTime 1.0 in 1992, providing system-level support for video and other multimedia features. System software version 7.1 came next in the fall of 1992, making the Macintosh a truly international computer, providing (among other things) support for 2-byte fonts such as those used by the East Asian writing systems.

Now, the Apple Open Collaboration Environment, AOCE, is coming to provide the integration of personal communications into the fabric of the Macintosh experience and a foundation for workgroup productivity and workflow automation solutions. These are significant enhancements that extend the power of System 7, along with QuickDraw GX and AppleScript. AOCE will greatly enhance Macintosh users' abilities to work effectively and collaboratively. For developers, these major enhancements provide opportunities for developing a new generation of products that extend the user's reach in exciting new ways.

WHAT IS AOCE SYSTEM SOFTWARE?

AOCE system software is a platform for integrating all forms of communications and collaboration. AOCE technology allows easy and seamless integration of its many services into any Macintosh application.

AOCE software also provides the means for communicating with other people, regardless of the personal communications systems they use. AOCE messaging technology allows you to automatically address a document on your desktop to someone else's fax machine, electronic mail address, or telephone, and to send the file directly from within the application that created it. It is no longer necessary to create a file and then open an electronic mail application to attach the file.

With increased power to communicate comes increased complexity in locating and identifying the parties with whom you want to communicate. To deal with this, AOCE software includes extensive directory services for providing access to

repositories containing information about the individuals, groups, services, data and facilities needed for effortless communication and collaboration.

Of course, with all the increase in communication, enhanced security may become a major concern. AOCE includes its own digital signatures, authentication, and encryption features.

This article can't cover everything you need to know about AOCE services, but it will introduce all the AOCE components and the services they provide. Future issues of *Apple Direct* will go into greater depth regarding some of the software components that you may want to employ for including these services in you applications.

COLLABORATIVE COMPUTING

With the exception of a one-person computer game, virtually all computer use today is "collaborative," that is, users generate information to share with coworkers, customers, or the world at large and access other users' information through electronic mail, database access, fax, or other means.

Collaboration can take place on the level of an individual, a workgroup, or a large enterprise; AOCE technology is designed to integrate and support collaborative applications and services in all environments.

Because of the existing demand for these services, a number of software products with collaborative features already exist. AOCE technology provides collaborative services at the system software level so that collaboration will be a feature of every Macintosh application. Two key benefits of this are a much greater level
of integration for the user and independence between applications and underlying services.

AOCE technology also provides a platform for new applications, especially dynamic, interactive, multiuser programs. With the release of AOCE technology, developers can create new types of applications that are not restricted to the current stand-alone application model.

AOCE technology opens the door to a wide range of new opportunities for developers to enhance or simplify their existing products and to provide new services. Apple is encouraging developers to identify ways to create new products using the technology provided by AOCE software.

AOCE ARCHITECTURE

AOCE technology comprises a varied and extensive set of components and features, so it's worthwhile to examine the architecture before further considering the parts. Let's take a look at the components of AOCE technology and get a sense of how the pieces fit together.

AOCE technology falls into four main categories: directories, store-and-forward messaging, authentication and privacy, and digital signatures. These four major areas of service can be accessed by any Macintosh application.

The illustration below ("AOCE Architecture") shows the AOCE components and their relationship to each other. Each of these components is further described in the rest of this article.

DESKTOP CAPABILITIES

AOCE software provides users with standard Macintosh methods for browsing, sending, receiving, and managing incoming and outgoing communications. A desktop *mailbox* provides the user with an "in-box" of all incoming letters, and a *directory browser* provides access to various directory services for sending letters. These items and others are shown in the illustration "The AOCE User Interface" below. The mailbox and browser are classified as *containers*—as are folders, the Trash, and hard disks—and, like other containers, the mailbox and directory browser reside on the desktop. AOCE technology defines a special category of messages, called *letters,* that are intended for the end user to read— for instance, through electronic mail or faxes—or listen to—for instance, through voice mail.

Desktop Mailbox. When a user receives letters, AOCE software displays them all in a single location, the desktop mailbox. In the mailbox, a user can sort and view all correspondence, using new enhancements to the Macintosh Finder. What this means is that mail comes to the user instead of the user having to go find the mail. Many people today send mail to and receive mail from a variety of sources, so a single "compound" mailbox greatly simplifies receiving mail, since users can access all messages with a single password.

Directory Browser. The directory browser capabilities provide the user with access to all directories; connectivity to each directory is provided by the appropriate Directory Service Access Module (DSAM), which resides in the user's System Folder.

Personal Directories. Users can also create any number of personal directories, which reside on the user's hard disk, on a floppy disk, or on a file server. Personal directories are portable and can be copied to other Macintosh hard disks or floppy disks, so that frequently used directory information can be available in any location.

Directory Templates. A directory template is a system software extension that extends and customizes the Macintosh desktop. A directory template controls the way directory records and their contents are displayed on the Macintosh desktop; for example, a template can be designed to select only certain fields of information, such as name and address, from a large record. The AOCE developer package provides several ready-made templates, but developers can create any number of custom templates to accommodate user needs. Directory templates can also be created to provide separate, discrete directories according to department, task, or any other personal category.

COLLABORATION PACKAGES

The two AOCE collaboration packages—the Standard Mail Package and the Standard Directory Package—are higher level functions and user interface capabilities that can be incorporated into existing applications with minimal development effort. Standard dialog boxes and other user interface elements are provided to allow users to select addresses, add attachments, and approve documents from within any application.

The Standard Mail Package. The Standard Mail Package provides a complete user interface, known as the mailer, that allows the user to send any application document as electronic mail or fax from within the application. In addition, a basic service is provided by a "send-letter" routine, which permits any application to send a letter, with enclosures, either as an image or as a file. However, this method does not provide a user interface; your application must provide that.

Developers should take advantage of the mailer to make their applications "mail-capable." The mailer is essentially a mailing label that users can add to documents and is the standard AOCE user interface for addressing and sending a letter. Using the mailer also makes drag-and-drop enclosures and digital signature
capabilities available to all applications.

When a user receives a letter containing a mailer, double-clicking on any attached document automatically launches the application that created it; double-clicking on an attached folder opens an appropriate Finder window. An application called the *letter application* allows a recipient to open AOCE letters in standard document interchange or image formats, thus allowing the recipient to read a message without having the original application.

The Standard Mail Package allows developers to add a lot of functionality with minimal effort. Apple's goal is to have all Macintosh applications become "mail capable."

Standard Directory Package. The Standard Directory Package allows developers to add directory browsing and record selection services to existing applications while maintaining consistent user access.

The Standard Directory Package provides standard user interface elements for browsing, finding, and selecting directory records and routines that display dialog boxes from within applications. It includes a directory *browsing panel,* similar in design to the Standard File dialog box that provides access to files from within an application. The browsing panel contains an editable text box, a scrolling list, and a pop-up menu that can be placed in any window. In the same way that users can browse their hard disks for files and folders, they now can use the browsing panel to browse their directories and quickly access directory information. The Standard Directory Package also includes a Find panel that allows a user to search by text string. Developers can use the package in conjunction with the AOCE Directory Manager to refer to a particular entity (for example, person, group, or server) in a directory.

This package also provides the user interface elements for applications to prompt users to provide name and password authentication information.

For many developers, the Standard Mail Package and Standard Directory Package will provide all the required AOCE capability and eliminate the need for direct access to the routines of the AOCE managers. The services provided by

these two packages will make sending and receiving documents, regardless of the transport method, as straightforward as file printing is today.

SYSTEM SOFTWARE MANAGERS AND INTERFACES

The AOCE system software managers are low-level components that provide developers with a rich set of services for collaboration. The data structures and routines for utilizing any of these services are available to all Macintosh developers.

Interprogram Messaging Manager. The Interprogram Messaging (IPM) Manager extends and complements the interapplication communications (IAC) capability of System 7 that provides real-time program-to-program communications. The IPM Manager provides store-and-forward message delivery between applications, allowing messages to be stored for delivery until the recipient chooses to receive them.

In the Apple Open Collaboration Environment, a *message* is defined as a collection of data consisting of a message header and containing address information, a table of contents, and any number of message blocks. The IPM Manager maintains queues on the local hard disk, where a message is stored and then forwarded when the receiver is ready to read it.

IPM allows a message to be sent to multiple destinations over any type of message transport, and there are no content or format restrictions. IPM messages are delivered by means of Messaging Service Access Modules (MSAMs) and can be sent to virtually any destination.

The IPM Manager application interface is the same no matter what transport medium is being used to carry the massage. For example, Apple provides one MSAM that allows the IPM Manager to send messages through an AppleTalk network, and another MSAM that allows messages to be sent by modem over telephones lines. Developers can provide MSAMs that allow the IPM Manager to use other messaging services such as PROFS, fax, Simple Mail Transfer Protocol (SMTP), MHS, and X.400.

The Directory Manager. A directory is an arrangement of object-oriented information in a hierarchical structure. AOCE directories may be created to store information consisting of any kind of addresses for mail and messaging services.

Within an AOCE directory, information is stored in a hierarchical structure made up of any number of directory nodes. A *directory node* (or *dNode*) can hold any number of other dNodes, directories, records, or mixture of all three.

A *directory record* is uniquely specified by a record ID that allows the Directory Manager to classify and locate the record. A record ID consists of record location information, the record's name, the record's type, and a creation ID. Records may contain any number of objects, called *attributes,* which make up the information stored in the record.

There are no restrictions on the type or internal structure of the information that directories contain. In general, directories contain information needed to make collaborative systems work well; this could be telephone numbers, pictures, or any of a wide variety of kinds of information. The Directory Manager makes all of this information available to all applications in standard format and data structures.

The standard AOCE metaphor for a directory record is an *information card,* which is something like a business card. Users can copy records located in any directory to their personal (local) directory or to the desktop. When such records are dragged to the desktop, a copy of the directory record is made as an information card. Information cards can be sent to and shared with others in much the same way we use paper business cards today.

A *personal directory* is a Macintosh HFS (hierarchical file system) file located on a user's hard disk. A personal directory can store anything that can be kept in any other type of directory and is often used to store frequently used information, such as information cards.

Other external directories are accessible to your application through the application programming interface (API) of the OCE Directory Manager by means of a Directory Service Access Module (DSAM). Users access and use different directories in exactly the same way. AOCE directories may be *distributed,* meaning the same directory can be replicated on multiple servers.

The Authentication Manager. The Authentication Manager provides security services between users on the same network using the same authentication and directory server. These security services provide protection against unintentional access to data by others on the network, intentional and unauthorized access to data, intentional destruction of data, and viruses.

The Authentication Manager also provides the tools for verifying the identity of parties communicating with each other and for keeping their communications private.

Mutual authentication is the process by which two people communicating over a network are able to identify each other conclusively. The originator is called the *initiator;* the addressee is called the *recipient.* Both initiator and recipient have secret digital *keys;* the AOCE authentication server functions as a "trusted third party," meaning it is the only entity to hold both keys, and thus is able to verify the identities of both parties.

An application can use the Authentication Manager API to handle the entire authentication process and validate the identity of the collaborating entities (people, servers, or programs).

Developers can take advantage of the authentication capabilities to improve overall security for their users and to simplify security administration, so that users need only one password to authenticate themselves to their computer and gain access to all of its services.

The Digital Signatures Manager. A digital signature is an encrypted number that is associated with a particular set of data. Digital signatures can be used from within any application, not only to positively identify the signer of the data, but also to detect whether a document has been tampered with since it was "signed." This ability to attest to the unaltered state of the document makes digital signatures more secure than signatures on paper.

The AOCE digital signature technology provides a means for attaching electronic approval signatures to computer documents, eliminating the need for time-consuming printing and circulation of paper for approvals. For example, developers of electronic forms applications will want to integrate digital signatures into their products so that users can electronically sign portions of forms.

Signatures can also be useful in database and accounting applications or anywhere that users need to have absolute confidence in the integrity of their data. A user can sign an entire document or only certain fields within a document or database record.

The Digital Signatures Manager includes routines that allow a developer to apply a digital signature to any set of data. A digital signature guarantees the identity of the person "signing" the document and that the data that was "signed"

has not been changed. A user can apply a digital signature to anything: a document, a field, even a memory address—whatever data needs to be verifiable.

An item with a verifiable digital signature is comparable to a paper document that is signed and notarized. In some ways, digital signatures can provide better security than signed paper forms: A digital signature cannot be forged, and a digitally signed document cannot be altered without the alteration being detected.

SERVICE ACCESS MODULES

The AOCE system software managers provide service access module interfaces, which allow developers to build plug-in modules for connecting AOCE-based computers to other messaging, directory, and authentication systems. Architecturally, these interfaces form back-end hooks into the IPM, Directory, and Authentication Managers.

Apple supplies MSAMs for AppleTalk networks, providing peer-to-peer dial-up, peer-to-peer AppleTalk LAN, and AOCE server messaging connectivity. Additional service access modules can be created for access to MHS, X.400, PROFS, and hundreds of other systems. DSAMs are provided for AppleTalk networks and Apple AOCE directory and authentication servers.

This aspect of the AOCE architecture is at the heart of the system's openness. It allows Macintosh users to easily collaborate with people using any type of mail or messaging system.

In later issues of *Apple Direct* we'll explain more about how to write service access modules, and we'll discuss the markets that Apple sees for these products.

AOCE SERVERS

Apple will sell two software-based servers: the Apple AOCE Directory and Authentication Server and the Apple AOCE Store and Forward Server, both of which can be used in conjunction with AOCE system software.

Apple AOCE Directory and Authentication Server. This server provides a full-function directory of hierarchical containers that hold records associated with entities (users, groups, servers, and other resources). The directory and authentication server can be used to store information needed to manage

workflow processes and to communicate important information between applications.

Directory and authentication servers will play a major role in enabling workgroup applications, making it easier for administrators to manage those applications and build more convenient access control and automation mechanisms.

Apple AOCE Store and Forward Server. The AOCE Store and Forward Server accepts letters and messages from users' computers and then delivers copies to appropriate destination servers and message queues, using a store-and-forward mechanism. The server forwards correspondence between Apple AOCE Store and Forward servers and enables AOCE-based computers to connect to any messaging system with the use of Server-based Messaging Service Access Modules (SMSAMs). Users can have mailboxes on the messaging server, allowing them to receive correspondence at all times, regardless of whether their Macintosh computers are switched on.

WHAT DEVELOPERS RECEIVE

The information in this article covers a lot of ground, so to sum up, here are the AOCE system software components provided by Apple for developers' use:

- Standard Mail Package:
  Mailer
- Standard Directory Package:
  Directory panel
- Desktop capabilities:
  Directory browser icon
  Information cards
  Directory templates
  Compound mailbox
  Personal directories
  Directory templates
- AOCE managers:
  Authentication Manager
  Directory Manager
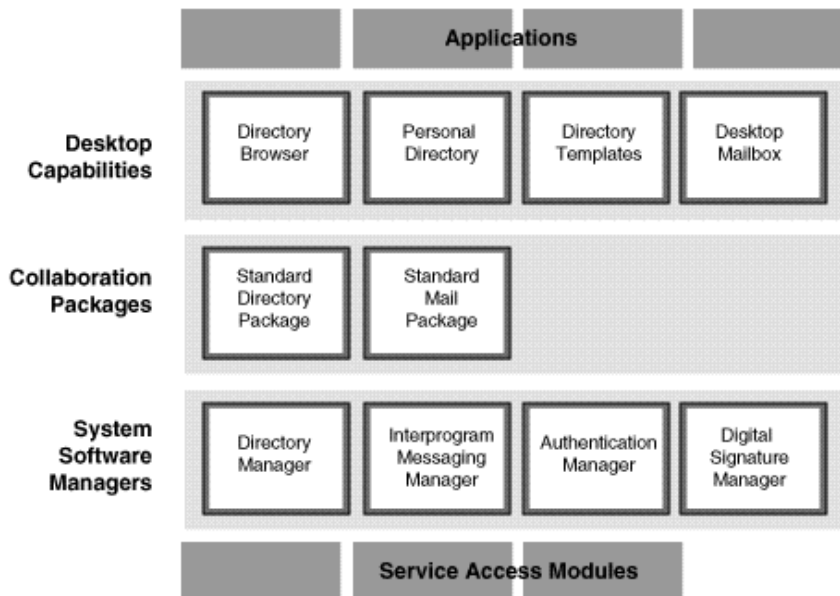 Interprogram Messaging Manager
  Digital Signature Manager

MORE TO COME

You will be seeing more about AOCE technology is future issues of *Apple Direct,* but for now the key point to keep in mind is this: AOCE technology allows users to collaborate, to share information, to access more information—while at the same time it provides greater security from tampering and falsification. And it does so without any disruption to the way users currently work and do business. It's Apple's hope that with AOCE services, developers can quickly build all these capabilities into their applications to make the Macintosh platform truly, and openly, collaborative. ◆
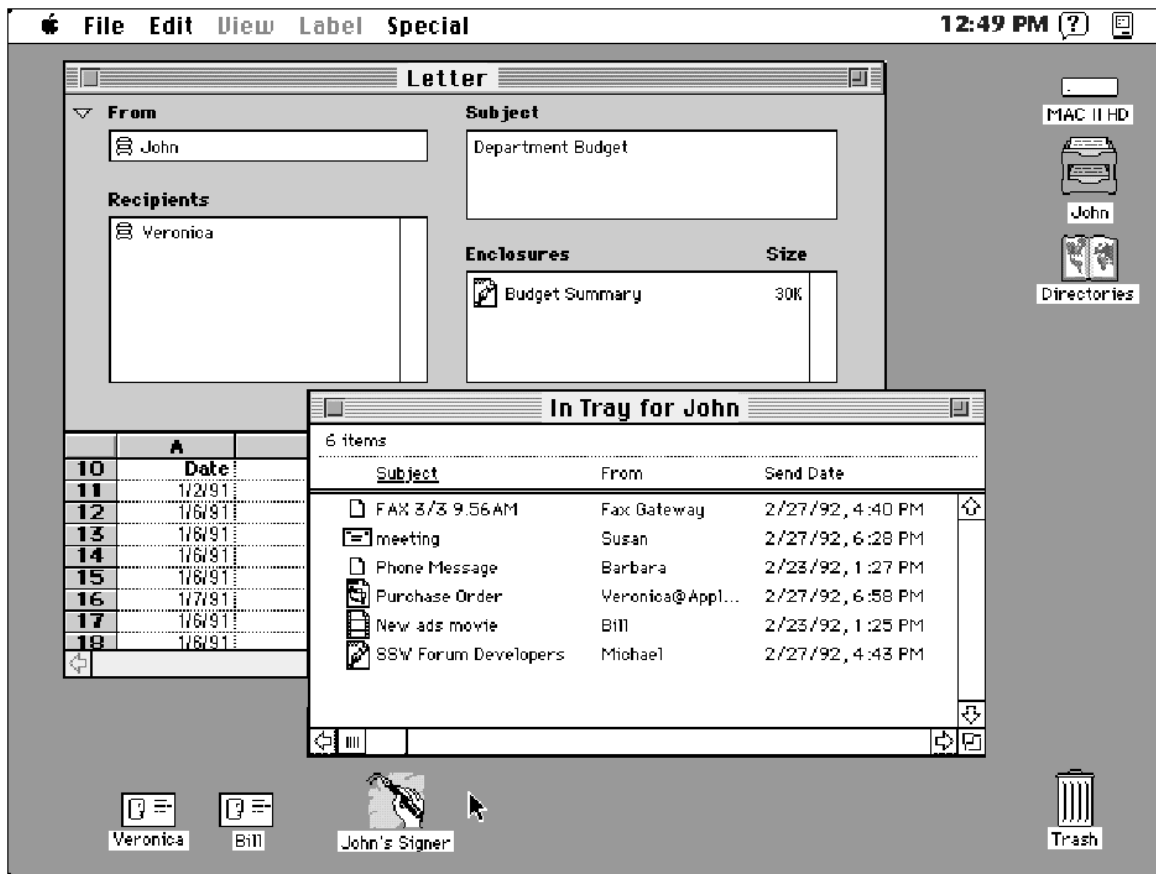

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	Applications		
Desktop Capabilities	Directory Browser	Personal Directory	Directory Templates	Desktop Mailbox
Collaboration Packages	Standard Directory Package	Standard Mail Package		
System Software Managers	Directory Manager	Interprogram Messaging Manager	Authentication Manager	Digital Signature Manager
	Service Access Modules		

****

File Edit View Label Special   12:49 PM

Letter

From
John

Recipients
Veronica

Subject
Department Budget

Enclosures   Size
Budget Summary   30K

MAC II HD

John

Directories

	A
10	Date
11	1/2/91
12	1/6/91
13	1/6/91
14	1/6/91
15	1/6/91
16	1/7/91
17	1/6/91
18	1/6/91

In Tray for John

6 items

Subject	From	Send Date
FAX 3/3 9.56AM	Fax Gateway	2/27/92, 4:40 PM
meeting	Susan	2/27/92, 6:28 PM
Phone Message	Barbara	2/23/92, 1:27 PM
Purchase Order	Veronica@Appl...	2/27/92, 6:58 PM
New ads movie	Bill	2/23/92, 1:25 PM
SSW Forum Developers	Michael	2/27/92, 4:43 PM

Veronica   Bill

John's Signer

Trash

AOCE User Interface

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**Two Scenarios of
AOCE Technology**

It's easier to understand the significance of AOCE technology through examples than to describe just how it can be used. Here are two scenarios that were demonstrated during the January 1992 Macworld Expo in San Francisco; both were created entirely from applications using AOCE technology and AppleScript. Instead of pie-in-the-sky examples of what will be possible someday, these are actual, working examples of collaborative tasks that can be created with AOCE right now.

Automating telephone orders. A small distribution company operates an "automated attendant," a telephone order line that allows existing customers to purchase products automatically by calling a toll-free number and responding to a voice-mail answering system. The customer enters responses to the recorded questions by pressing the buttons on a touch-tone phone. An off-the-shelf application allowed the company to build a sequence of computer-based events that answers the phone, prompts the customer for the needed information (customer account number, desired merchandise quantity, and so forth) explains the menu choices, enters the customer's responses in appropriate databases and other applications, and generates a customer order form. In this scenario, each customer order must be reviewed by the sales manager and credit manager before it can be processed by the accounting system.

This model uses AOCE and AppleScript to build a completely electronic work-flow system. Its developers wrote a script that automatically checks the customer's purchase amount against an existing database of customer credit limits, and then generates the appropriate notification fax or electronic mail messages that are sent to the sales and credit managers. Gateways to various electronic mail systems are provided by custom-built Messaging Service Access Modules (MSAMs), which interface with AOCE through its set of APIs. Fax and mail messages are generated directly from the application by means of the AOCE mailer, a feature of the AOCE Standard Mail Package that makes sending a message as easy as selecting a Send command in the Macintosh File menu.

The sales and credit managers can be certain that approved purchases have their authorized signatures by using the AOCE digital signatures feature, which allows them to detect whether a document has been altered since it was signed. If the customer's order is approved, the system then orders the item, debits the customer's account, debits the company inventory database, and so forth. All the necessary paperwork is generated, and a staff member needs only to obtain the item from inventory, package it, and mail it.

This scenario shows how AOCE technology, together with AppleScript and existing applications, can automate the work flow of a small business or department in ways that have previously been unfeasible. This new technology extends the user's reach beyond the local area network, incorporating

electronic mail and fax; it also provides the means to append digital signatures to documents to assure authorization and security.

Assisting the Home Investor. A home investor maintains an extensive stock portfolio. She has completely automated the process of tracking and presenting information about her portfolio, and streamlined the process of making buy and sell decisions. Using AOCE technology, she receives large quantities of unedited information from various news-wire services that are accessed by AOCE using specially created MSAMs.

Using AOCE and AppleScript, the investor has created one AOCE-based "software agent" to receive and track the day-to-day news that might affect her stocks and the market as a whole, and to send her bulletins. Another agent receives moment-by-moment notices of significant changes in stock prices—say, a rise or fall of two points or more—and sends ticker updates. A third agent processes the various notices and news bulletins using a spreadsheet and database. The fourth agent prepares buy and sell order forms based on the parameters that the investor has determined. All the investor has to do is evaluate each buy or sell recommendation based on all of the information amassed by the agents.

This example shows the power of AOCE to improve personal productivity by automating processes in a way that previously could not be done.

In the two scenarios just described, the user knows exactly which steps need to be taken in each event, but completion of these tasks is limited by time, accessibility and the effort involved. With AOCE technology, a person's work flow is automated, large quantities of information are sorted through and relevant data selected, accounting systems are updated, and many time-consuming tasks are done automatically by the system. In each case, these steps are taken by the user's Macintosh computer. Decisions that require consideration—how to fix the broken printer, whether to buy that stock—are left to the expert, the human being at the top of the chain of command. ◆

The LaserWriter Select 300 and 310

By Gregg Williams

An Apple LaserWriter for under $900? A *PostScript™* LaserWriter for under $1200? These aggressive prices (actually, $819 and $1,079, U.S. suggested retail price) belong to Apple's two newest printers, the LaserWriter Select 300 and 310.

These printers come from Apple Computer's new strategy of designing products to match selected audiences—and the results look pretty good. Here's a closer look at what Apple is doing with these printers and why. (Next month, we'll take a more in-depth look at the technology inside them.)

By focusing a product's features to match a known audience, Apple has found that it can offer a very useful, full-featured product *for that audience* at a very competitive price. That's what we've tried to do with the new LaserWriter Select 300 and 310 printers. Here are the main characteristics of this audience:

• Their needs are simple—their documents are mostly simple text.

• They probably have 68030 Macintosh computers, and they're buying printers either with or shortly after the purchase of their computers.

• Their budgets are limited, but they are willing to pay extra for printers that can grow with them.

• They work out of their homes or they bring work from the office to do at home.

Looking at this audience, we found that they disagreed on one item—PostScript. PostScript was not important to some customers (some didn't even know what it was), while others genuinely wanted it or felt they needed it. This led to two products, the LaserWriter Select 300 printer, for cost-conscious customers who don't need PostScript, and the LaserWriter Select 310 printer, for those who do.

These two printers are interesting because they are very similar and yet very different. They share the same design and numerous features (see "Apple LaserWriter Select 300 and 310 Fact Sheet" below); in fact, the LaserWriter Select 300 can be modified to *become* a LaserWriter Select 310. Both are direct-connect printers; that is, they connect directly to the Macintosh that's using them through a serial port. (The LaserWriter Select 310 can also connect to a PC running Windows 3.0 or 3.1 through its parallel port.)

And yet, these two printers are fundamentally different. The LaserWriter Select 300 is a QuickDraw printer that uses TrueType fonts and is driven by the Macintosh to which it's connected. The LaserWriter Select 310 is a true Adobe™ PostScript printer that uses Type 1 fonts and is powered by a built-in Am29205 RISC (Reduced Instruction-Set Computer) processor.

LaserWriter Select 300 Summary. Here are the most important points about this printer:

• The LaserWriter Select 300 uses a 300-dpi (dots per inch) laser engine, a new design built by Fuji Xerox. Built-in hardware by Apple adds FinePrint, an enhancement that improves the quality of printed text by stretching the width of the engine's pixels. The laser engine prints up to five pages per minute (ppm). Since this printer is driven by the Macintosh computer to which it's connected, it will print at different rates when connected to different Macintosh models.

• The LaserWriter Select 300 printer driver contains Apple's new GrayShare printer technology. GrayShare allows the printer to print grayscale (as opposed to exclusively black-and-white) images. Also, the printer's owner can configure the printer to be used by other Macintosh users on the same network. (For more details, see "GrayShare: A New Printer Technology" in the February 1993 issue of *Apple Direct*.)

• The LaserWriter Select 300 can hold up to 250 sheets of paper and has several paper-handling options (discussed later in this article).

• This printer includes 39 TrueType fonts in 15 font families.

• Because of its use of GrayShare technology, the LaserWriter Select 300 can print in the background (a feature that most printers in this price range don't have).

LaserWriter Select 300 Expandability. Expandability has always been important for any computer product, but it becomes more so when customers, possibly first-time customers, are contemplating a purchase of considerable expense in a field that they may not understand. Expandability becomes a hedge against their fear that they are making the wrong choice. Customers are more likely to buy products that they know they can upgrade later.

The LaserWriter Select 300 is expandable in several ways. With the optional paper feeders and tray, the printer can hold up to four types of paper, up to 800

pages total. You can also print the first page of a document from one source and the remaining pages from another source.

If you add 4 MB of memory, you enable the printer's PhotoGrade technology, which greatly improves the quality of grayscale images. In fact, when printing grayscale images—not text—PhotoGrade allows the augmented LaserWriter Select 300 to print over 90 shades of gray, the equivalent of an 800-dpi printer.

As mentioned earlier, you can also replace the main logic board and turn the LaserWriter Select 300 into a LaserWriter Select 310.

LaserWriter Select 310 Summary. Here are the most important LaserWriter Select 310 features:

• The LaserWriter Select 310 offers true Adobe PostScript. Since the customers for this printer probably have simple printing needs, they almost certainly won't have any use for the advanced features of PostScript Level 2. So the LaserWriter Select 310 comes with PostScript Level 1, at a considerable savings to its customers.

• The LaserWriter Select 310 uses the same 300-dpi laser engine as the LaserWriter Select 300. However, the LaserWriter Select 310 is driven by an AMD Am29205 RISC processor. Because its behavior is dictated by PostScript, the LaserWriter Select 310 doesn't have any of the benefits that are tied to the QuickDraw printing model—namely, FinePrint, PhotoGrade, and GrayShare.

• The LaserWriter Select 310 has the same paper-handling capabilities as the LaserWriter Select 300.

• This printer includes 13 PostScript Level 1 fonts in four font families: Courier, Helvetica®, Times®, and Symbol. These fonts are in the ROM of the LaserWriter Select 310 and do not take away from the printer's memory when printing a document. (The user can add any Level 1 font available on the market, but such a font—called a *downloadable font*—is sent from the computer to the printer and takes up part of the printer's memory. Apple recommends that an unaugmented LaserWriter Select 310 be limited to printing documents that use a maximum of three downloadable fonts.)

• The LaserWriter Select 310 can print in the background (again, a benefit that most competing printers don't have).

• A very important feature of the LaserWriter Select 310 is that it is designed to be used by a PC running Windows 3.0 or 3.1 *or* a DOS program that includes a PostScript LaserWriter driver. The LaserWriter Select 310 has a parallel port,

which is the port most commonly used to connect a PC to a printer. Apple also supplies a Windows disk with the LaserWriter Select 310. With this disk, the user can add a driver for the LaserWriter Select 310 that
is better than the generic LaserWriter driver supplied with Windows (see "Apple Does Windows" below). The Apple driver, for example, allows any Windows application access to the printer's multiple paper sources.

LaserWriter Select 310 Expandability. Expanda-bility is also an issue for customers here, too. As with the LaserWriter Select 300, the LaserWriter Select 310 can hold up to four types of paper, to a total of 800 pages at one time. It can also print the first page of a document from one source and the remaining pages from another. If the user adds more memory, the LaserWriter Select 310 can print on pages up to legal page size and can use more downloadable fonts. ◆

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Executive Summary

The Apple LaserWriter Select 300 and 310 printers provide full-featured laser-engine printing at competitive prices—$819 for the QuickDraw-based LaserWriter Select 300, and $1,079 for the PostScript-based LaserWriter Select 310. (Prices quoted here are U.S. suggested retail prices, not final when this went to press.) Both printers should appeal to first-time buyers whose printing needs are simple and whose budgets are limited. The LaserWriter Select 310 distinguishes itself by working well with PCs that run Microsoft Windows 3.0 or 3.1, as well as with PostScript-based DOS programs. Apple is planning to promote the LaserWriter Select 310 aggressively to the Windows/DOS market.

For technical details about these printers, see next month's *Apple Direct.* ◆

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Apple LW Select 310 on LPT1:

Paper **S**ource:	Upper Tray ⬍
Paper Si**z**e:	Letter 8.5 x 11 in ⬍

Orientation
[A] ◉ Portrait
    ○ **L**andscape

Copies:
1

[**OK**]
[Cancel]
[**O**ptions...]
[**A**bout...]
[**H**elp]
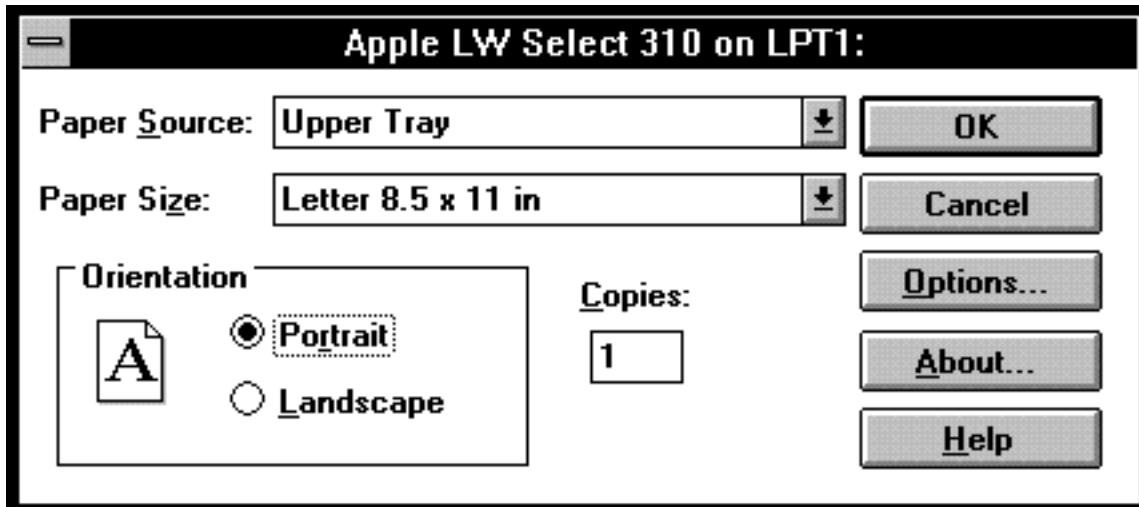
__Apple Does Windows.__ The LaserWriter Select 310 was designed to work on a PC running Microsoft Windows 3.0 or 3.1, and the printer comes with a disk of Windows software. Once the user installs Apple's enhanced LaserWriter driver, a Windows program's page-setup dialog box looks like this.

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Apple LaserWriter Select 300 and 310 Fact Sheet

	LaserWriter Select 300	**LaserWriter Select 310**
Marking engine	• Fuji Xerox laser engine	Same as LaserWriter Select 300
Controller	• None; it is driven by the computer it's connected to	• AMD Am29205 RISC processor
Memory	• 512 KB memory; you can add 1 MB or 4 MB extra memory • Data compression between computer and printer increases the area that can be manipulated with a given amount of memory)	• 1.5 MB memory; you can add 1 MB or 4 MB extra memory

Print quality	• 300 dots per inch (dpi), with additional enhancements with FinePrint • GrayShare technology allows printing of grayscale images • Can also run PhotoGrade with addition of 4 MB of memory (increases grayscale image quality)	• 300 dots per inch (dpi) • PostScript Level 1 technology allows the printing of high-quality grayscale images
PostScript	• A board-level upgrade makes this printer equivalent to a LaserWriter Select 310; *this upgrade removes all FinePrint, PhotoGrade, and GrayShare features and changes the printer from a QuickDraw printer to a PostScript printer*	• PostScript Level 1, by Adobe
Fonts	• 39 TrueType fonts on disk (including font families like Avant Garde, Courier, Helvetica, Palatino®, and Times) • Supports any TrueType fonts (supports Type 1 fonts when Adobe Type Manager present)	• 13 fonts from the following font families: Courier, Helvetica, Times, and Symbol • Works with Type 1 fonts (see "System Requirements" below)
Speed	• Five pages per minute maximum (prints faster—up to five ppm limit—when connected to faster Macintosh computer)	• Five pages per minute maximum
Interfaces	• High-speed RS-422 serial interface	• Serial port for connecting to Macintosh computers • Parallel port for connecting to DOS or Windows computers
Recommended duty cycle	• Toner cartridge: 4,000 pages at 5% density • Printer: minimum 150,000 pages	• Same as LaserWriter Select 300

Paper capacities	• 250-sheet feeder (holds U.S. letter and legal, A4 sizes) • Manual feed tray • Optional 250-sheet or 500-sheet feeder • Optional 50-sheet multipurpose tray (also holds up to five envelopes)	• Same as LaserWriter Select 300
System requirements	• Any Apple Macintosh computer with at least 1 MB of memory and a hard disk • System Software 6.0.7 or later • Recommended: 4 MB of memory or more when used with System 7 or later • To print grayscale images, computer used must be running Color QuickDraw (Macintosh II or later)	• Any Macintosh running System Software 6.0.7 (with TrueType extension) or later, or any version of System 7 • Any personal computer running Windows 3.x • DOS applications with a PostScript driver • Extra memory recommended for printing legal-size documents
Size and weight	• Size: 15 in. (38 cm) x 8 in. (25.3 cm) x 18.3 in. (45 cm) • Weight: 26 lb. (12 kg)	• Same as LaserWriter Select 300
Power requirements	• United States/Japan: 100–115 V AC, 50–60 Hz • Europe/Australia: 220–240 V AC, 50 Hz	• Same as LaserWriter Select 300
Prices (U.S. Suggested Retail Prices)	$819 in United States (varies in other countries)	$1,079 in United States (varies in other countries)

Nagel Named To Lead Macintosh Software Development

David Nagel, vice president of Apple's Advanced Technology Group (ATG), has been named senior vice president of the Macintosh Software Architecture division (MSAD), assuming the post left vacant by Roger Heinen in January when he left to work for Microsoft.

Nagel's appointment, which came less than a month after Heinen's departure, puts a seasoned Apple executive in charge of the division responsible for developing Macintosh system software. The quick succession means that Macintosh software development efforts should continue without the hitch normally associated with a top management position's vacancy.

Nagel, a five-year veteran of Apple, will retain his position as head of the Advancd Technology Group. He'll report directly to President and Chief Operation Officer Michael Spindler and remain a member of the Executive Management Team. Nagel has two degrees in engineering and a doctorate in experimental psychology. ◆

A Macintosh for Every Pocketbook

The Macintosh Centris 610 and 650, Macintosh Quadra 800, and Macintosh LC III

By Gregg Williams
Apple Direct *Staff*

Five new desktop Macintosh computers are out this month, bringing the total number of Macintosh desktop models sold today to *eleven* (not even counting PowerBooks). Pandemonium? No, *choice.* Apple can no longer afford to think of the buying audience as one undifferentiated group. Different people have different needs, value different features, and must buy in different price ranges. With the current lineup of desktop Macintosh computers (see "Macintosh Desktop Computer Prices", below), Apple aims to have a Macintosh computer in everybody's price range. *[Editor's note: The word "Five" at the beginning of this article is not a mistake. This article covers the four modular models; the fifth, the all-in-one Macintosh Color Classic®, is covered below.]*

Apple's strategy is built on three cornerstones. The first: Constantly improve Apple products to give customers maximum value for their money. This means improving existing Macintosh models and "retiring" the old versions—like the faster Quadra 950 replacing the original Quadra 900.

The second cornerstone: Make sure that Apple products can grow to meet customers' future needs. Computers and printers are major purchases for most people, and they may feel insecure about buying products that they don't know much about. Knowing that a product is expandable reassures customers that their purchases are good investments and that Apple's products can grow as their needs change.

The third cornerstone is the most important: Maximize customers' satisfaction by offering the features they want and omitting other features that would make the product more expensive and less competitive. (Of course, this assumes that you know your customers, have asked them what they want, and have observed what they actually use—and we think we've done that.)

This article surveys Apple's new mid-range and high-end Macintosh models, which were introduced on February 10 at MACWORLD Expo/Tokyo. (Two other

articles in this issue examine the two new color Macintosh models, the Macintosh Color Classic and the Macintosh PowerBook 165c, and two new low-end LaserWriter printers, the LaserWriter Select 300 and 310.) In next month's *Apple Direct,* we'll look inside these products and tell you what technical information you need to know.

MACINTOSH CENTRIS 610/650 STRATEGY

A 68040 Macintosh for under $3000! Very impressive—Apple's getting aggressive, responding to a competitive environment, don't you think? Would you believe *under $2500?* This has to be a trick question, right? Well, if you don't believe that, I guess you'll never believe that (in the United States, at least) you will be able to buy a fast, full-functioned 68040-based Macintosh with a list price of *under $2000.* It's true: The new Macintosh Centris 610, which is powered by a 20-MHz MC68LC040 processor, is priced (as this went to press) at a U.S. suggested retail price of $1,859.

Yes, times have changed, and Apple is introducing the Macintosh Centris line of Macintosh computers with two models that deliver an incredible amount of computing power for the money—*and* make such computing power available to most of the users who really need it. (Apple will continue to sell the Macintosh IIvx, which is also considered to be a member of the Centris line of personal computers.)

Mainstream 68040. *Mainstream* is a key word for the Macintosh Centris 610 and 650 computers. With these two computers, Apple intends to make the Motorola 68040 processor part of the mainstream of Macintosh computing.

Apple believes that putting 68040 power into the hands of as many people as possible is important for several reasons. First, it's an axiom of modern life that you can never be too rich, too thin, or have too much computing power. No one likes to wait, and the faster the Macintosh, the less waiting you'll do—for recalculating spreadsheets, manipulating documents being desktop published, indexing long documents, and so on.

Second, today's applications demand more computing power. PageMaker, for example, is orders of magnitude larger than MacWrite®; correspondingly, the Macintosh model that runs PageMaker needs more power than, say, the Macintosh 512K enhanced that you once used to run MacWrite.

Third, many of tomorrow's cutting-edge applications will depend on having more computing power than is commonly available now. If Apple doesn't put more computing power into the installed base of Macintosh computers, you won't have the raw materials you need to make the "killer apps" of 1994 and beyond.

Flexibility, Today and Tomorrow. I've already talked about how customers will be attracted to Macintosh Centris computers because of the high level of computing power they deliver per dollar spent. These computers are important because of the two kinds of flexibility they give potential customers.

Flexibility today means that the Macintosh Centris line gives customers a wide set of features from which to choose—that way, they can buy computers that meet their needs but aren't more expensive because of features they don't need or want.

As one example, Apple is trying something new with the Macintosh Centris 610 and 650—optional on-board Ethernet. You can buy either computer with or without Ethernet on the main logic board. What's the advantage? If you want Ethernet, you can buy it, and it doesn't take up a NuBus™ slot; that's *very* important for the Macintosh Centris 610, which has only one processor-direct slot (PDS) that can, with the right adapter, become a NuBus slot. If you don't want Ethernet, you don't have to pay for it (thus knocking several hundred dollars off the computer's price). Even if you decide you want Ethernet later, you can use a PDS or NuBus card to add it.

Flexibility tomorrow means that each Macintosh Centris is designed to allow customers to add new functions (extra hardware) or resources (more memory, for example). One key at-purchase option is the AppleCD 300i CD-ROM drive, which comes bundled with a number of "sampler" and "demo" CD-ROM discs. The next two sections give expansion details on the Macintosh Centris 610 and 650.

Macintosh Centris 610. Apple calls this computer "the most affordable 68040 Macintosh"—and with a base price expected to be $1,859 (U.S. suggested retail price), you certainly can't argue with that description. The Centris 610 offers customers a moderate amount of flexibility without forcing them to pay for features they don't want.

Here are the main features of the Macintosh Centris 610 (note the various expansion options):

• performance of up to two times that of a Macintosh IIci or IIvx

• built-in support of all Apple monitors (no NuBus video card needed)

• one internal PDS that, with the appropriate adapter, can hold a NuBus card (because of space limitations, such cards must be 7 inches or shorter)

• 4 or 8 megabytes (MB) of memory, expandable to 68 MB (the Macintosh Centris 610 has 4 MB of memory on the main logic board and two SIMM slots; the 8 MB configuration uses one 4 MB SIMM in one of the two SIMM slots)

• 512 kilobytes (KB) of video memory (VRAM), expandable to 1 MB (gives 8-bit color on many monitors, or 16-bit color with expansion video memory)

• one internal bay for one half-height 5.25-inch SCSI removable-media device (including the AppleCD 300i CD-ROM drive, which can be an at-purchase option)

• one internal bay for a 3.5-inch one-third-height SCSI peripheral (normally houses the computer's internal 80, 230, or 500 MB hard disk)

For a detailed overview of the Macintosh Centris 610 and 650, see the "Macintosh Centris 610 and 650 Fact Sheet" below.

To make the Macintosh Centris 610 available at such a low price, Apple decided to use the Motorola 68LC040 processor, running at 20 MHz. This processor does not include the internal floating-point functions available in other models of the MC68040 processor family.

Macintosh Centris 650. Apple describes the Macintosh Centris 650 as "the highest-performance and most flexible Macintosh Centris computer." The Macintosh Centris 650 differs from the 610 in that it is faster and offers users a lot more "elbow room" for at-purchase options and future expandability. (The entry-level Macintosh Centris 650, with a U.S. suggested retail price of $2,699, is $840 more expensive than its Macintosh Centris 610 counterpart.)

The Macintosh Centris 650 offers the Macintosh Centris 610 features mentioned earlier but adds the following (again, note the expansion options):

• performance of up to three times that of a Macintosh IIci or IIvx

• one 68040 PDS

• three NuBus slots (each slot holds a full-size NuBus card—however, one slot is unavailable if a PDS card is present)

• 4, 8, or 24 MB of memory, expandable to 132 MB

• one internal bay for a 3.5-inch SCSI peripheral (this normally houses the computer's internal 80, 230, or 500 MB hard disk)

Depending on the configuration, the Macintosh Centris 650 may include or exclude the arithmetic floating-point circuitry as part of the processor. The Macintosh Centris 650 processor is socketed on the main logic board. (In the United States, the least expensive configuration lacks the floating-point functions.) A user who wants to add the on-chip floating-point functions can simply remove the MC68LC040 processor and replace it with an MC68040 processor (ouch!).

With the Macintosh Centris 610 and 650 computers, Apple is putting 68040 performance and Macintosh quality within reach of many users. Users on a budget can buy the Macintosh Centris 610, which is a full-featured Macintosh with enough expandability for many users. For around $1000 more, they can get the Macintosh Centris 650, which is faster and has even more expandability built into it.

MACINTOSH QUADRA 800 STRATEGY

Mondo, deluxe, top-of-the-line, the works, the whole enchilada, everything but the kitchen sink—no matter how you say it, that's what Macintosh Quadra computers are, the fastest, most fully configured, most expandable Macintosh computers around. Standard Macintosh Quadra features include 8 MB of memory, Ethernet, and extra room for internal SCSI devices (especially devices that need front-panel space for removable mass media—things like Bernoulli drives, tape-backup units, and the AppleCD 300i CD-ROM drive).

Why a Quadra? You don't have to be a marketing expert to realize that the Macintosh Centris 650 and the Macintosh Quadra 800 are very similar. (They should be—they come from the same basic design.) So why did Apple make one of them a Quadra?

The Macintosh Quadra 800 is a Quadra because it is a top-of-the-line Macintosh. It always has Ethernet, it always has the full MC68040 processor (and it's faster, running at 33 MHz), and it has space for one more internal SCSI device that has access to the front panel. See the Macintosh Quadra 800 Fact Sheet (below) for details. If you don't want these features and don't mind having

a 25 MHz 68040 computer, buy a Macintosh Centris 650—you'll save about $1,100 (in the United States, at least).

"Quadra Power, for Less." That's Apple's sum-it-up-in-a-sentence *raison d'être* for the Macintosh Quadra 800. The Macintosh Quadra 800 will be an incredibly good buy for many customers: It runs almost exactly as fast as a Macintosh Quadra 950—they both run at the same speed, 33 MHz—but it costs about $1,300 less!

So why would anyone want to buy a Macintosh Quadra 950? In one way, the Macintosh Quadra 800 and 950 are similar to the Macintosh Centris 610 and 650: The more expensive computer has a wider range of expansion options. The Macintosh Quadra 950 has five NuBus slots (versus three slots in the Macintosh Quadra 800), supports a maximum of 24-bit video (versus 16-bit video in the Macintosh Quadra 800), and can hold up to four internal SCSI devices (versus three in the Macintosh Quadra 800).

What this means is that customers can now own the fastest Macintosh that Apple sells for about 20 percent less money (based on a $5,389 Macintosh Quadra 800 and its $6,739 Macintosh Quadra 950 equivalent—again, these are U.S. suggested retail prices).

MACINTOSH LC III STRATEGY

The Macintosh LC and LC II have been Apple's most popular personal computers to date, combining low cost, color, and versatility in a slim, modular package. However, when Apple asked potential customers (both Macintosh owners and non-owners) what they'd like to see in a Macintosh LC–family computer, they weren't shy. They said more computing power, support for more colors and larger monitors, and more memory. So that's what the Macintosh LC III gives them. (See the Macintosh LC III Fact Sheet bekow for details.)

More Computing Power. The Macintosh LC III has almost twice the performance of the Macintosh LC II. Here's another gratifying benchmark: In a series of application-level tests using programs like Microsoft Word and Adobe Illustrator, the Macintosh LC III ran about 25 percent faster than a 25-MHz Zeos 486SLC, a PC that could be considered superior because it uses an Intel 80486-family processor.

The Macintosh LC III's increase in computing power comes from several sources. First, it uses a 25 MHz 68030 processor (the Macintosh LC II's 68030 runs at 16 MHz). Second, it has a 32-bit internal data bus, which allows 68030 instructions to execute faster (the Macintosh LC II's data bus is 16 bits wide). For even more speed, customers can add a 68882 math coprocessor chip to the chip socket on the Macintosh LC III's main logic board.

Larger Monitors and More Colors. Some potential customers liked the Macintosh LC II but wanted to use the full-page, grayscale Macintosh Portrait Display or the Macintosh 16-inch Color Display. Unfortunately, the largest monitor that the Macintosh LC II offers built-in support for is the 14-inch Macintosh Color Display. (You *can* connect larger monitors, but the needed video card will take up the Macintosh LC II's single expansion slot.) Others wanted 16-bit color, but the Macintosh LC II could deliver that only on the Macintosh 12-inch RGB Display.

The Macintosh LC III meets these customers' desire for larger monitors and more colors. Once extra video memory has been added, the Macintosh LC III provides built-in 8-bit video support for all Apple monitors up through the Macintosh 16-inch Color Display. It similarly provides for 16-bit color support for all Apple monitors up through the 14-inch Macintosh Color Display.

More Memory. Remember when 8 MB of memory was considered a lot? These days, applications demand more and more memory, and users like the convenience of having multiple applications open simultaneously. The 10 MB maximum capacity of the Macintosh LC II was (and still is) enough for many people, but a good number would use more than 10 MB if they could.

The Macintosh LC III comes with 4 MB on the main logic board and can be expanded to a maximum of 36 MB through one 72-pin SIMM slot. This marks an important change in Apple's use of SIMMs (Single Inline Memory Modules). Previously, Apple had used its own 30-pin SIMM design but is adopting the 72-pin design commonly used in the PC world. In fact, all the new modular desktop Macintosh models introduced this month use the new 72-pin SIMMs (only the Macintosh Color Classic uses the older 30-pin SIMMs).

Not only does this new SIMM packaging mean that users can buy SIMMs from more sources, it also means that Apple can lower the price of the Macintosh LC III slightly. The reason for this is simple: 72-pin SIMMs can be double-sided,

which means that Apple can add more memory with fewer SIMM sockets and a slightly smaller main logic board, both of which decrease the computer's price. The Macintosh LC III has only one SIMM slot (down from two on the Macintosh LC II), yet it can hold a double-sided SIMM that contains 32 MB of memory.

Macintosh LC III PDS. Compatibility looks to the past, expandability looks to the future; both are important. Apple provides both with the Macintosh LC III PDS. This PDS is a 114-pin connector in two sections. The first section has 96 pins and connects to most Macintosh LC and LC II PDS cards, including the popular Apple IIe Card and the Ethernet LC Card. The remaining 18-pin section has additional signals that make the slot a true processor-direct slot (the original slot lacked lines for several important signals coming from the 68030 processor) and provides for future expansion.

Price. As you'll see from the prices and capacities of all these new computers, Apple wants to offer a Macintosh for literally every price range. The U.S. suggested retail price for a Macintosh LC III with 4 MB of memory, an 80 MB hard disk, and an Apple Keyboard II is $1,379. Apple is not discontinuing the Macintosh LC II but is pricing it somewhat below the Macintosh LC III (the same configuration in a Macintosh LC II has a U.S. suggested retail price of $1,199, $180 less than the equivalent Macintosh LC III).

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This is a great time to be buying a Macintosh computer. Not only can customers get a maximum of computing power and Macintosh flexibility and ease-of-use, they also have *choices.* If you look at "Macintosh Desktop Computer Prices" above, you will see that within a $500-wide horizontal band, customers can buy varying combinations of features, computing power, and expandability. "Expected Audiences for Apple's New Desktop Computers" below, tries to describe what may attract a customer to one of the newly announced Macintosh models.

Of course, the more Macintosh computers that Apple sells, the more potential customers you have for your products. We hope that this discussion of these new Macintosh computers and their intended audiences will help you plan your company's future directions. ◆

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Executive Summary

Apple's strategy for new products has three important parts:
- Give customers maximum value for the money.
- Make sure that the product can grow to meet customers' future needs.
- Maximize customers' satisfaction (and minimize price) by offering only the features they want.

The new Macintosh Centris 610 and 650 mid-range computers bring the power of the 68040 processor (currently used in our high-end Macintosh Quadra 700 and 950) into the $2,000–$5,000 range. (The dollar amounts listed here are tentative and are valid for the U.S. market only.) The less expensive Macintosh Centris 610 has a moderate level of expandability and is best for users who don't need features like multiple NuBus slots. The Macintosh Centris 650 costs more but is faster and more expandable.

Macintosh Quadra computers are the most powerful, full-featured Macintosh computers that Apple sells. The new Macintosh Quadra 800 supplies the same amount of computing power as the top-of-the-line Macintosh Quadra 950 for about $1,300 less. How? By taking out some of the expandability that most users won't notice. The Macintosh Quadra 800 has three NuBus slots (as opposed to five in the Macintosh Quadra 950) and delivers on-board video of up to 16 bits per pixel (versus 24 on the Macintosh Quadra 950).

The Macintosh LC III improves upon Apple's best-selling desktop Macintosh, the Macintosh LC II (which stays on the product list for customers on a tighter budget). The Macintosh LC III has almost twice the performance of an Macintosh LC II for a price difference of about $180. The Macintosh LC III can use expanded, more capable expansion cards (also called processor-direct slot [PDS] cards) but is backward-compatible with existing Macintosh LC and LC II cards.

For more technical details about these computers, see next month's *Apple Direct.* ◆
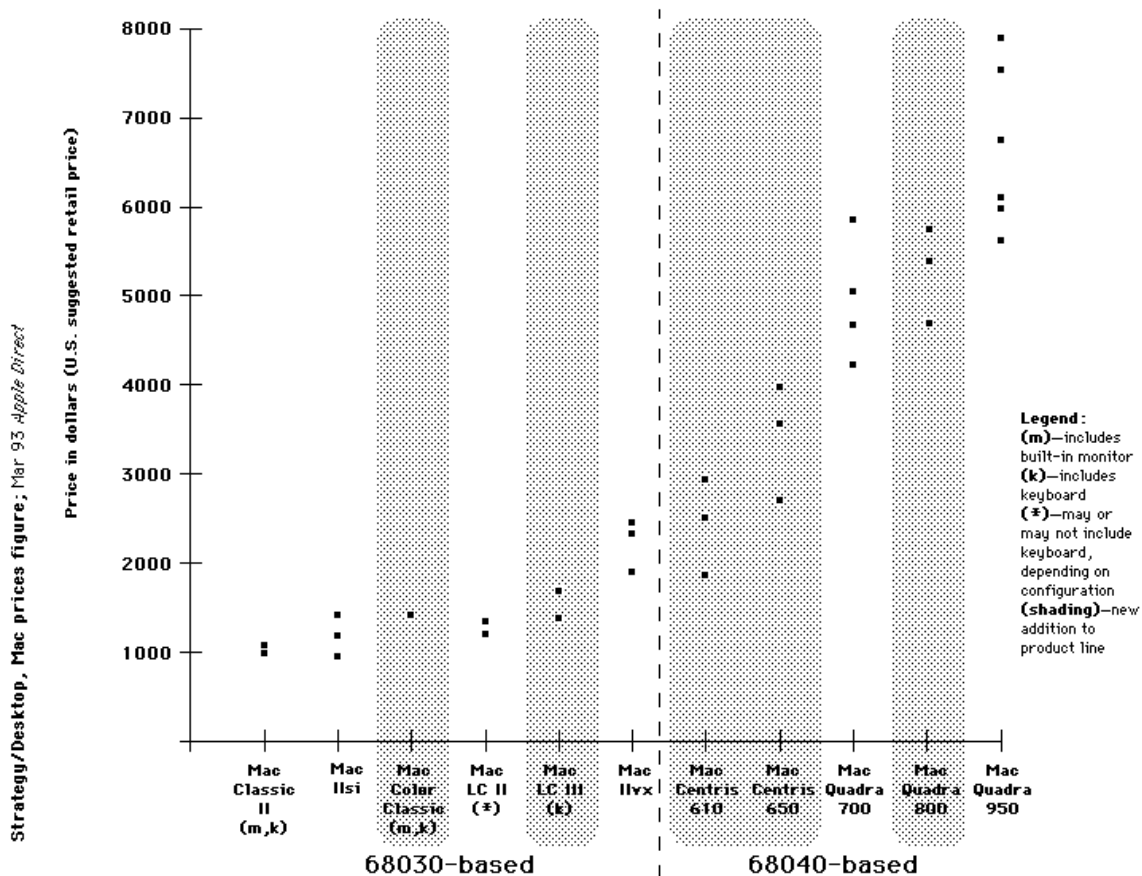
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Expected Audiences for Apple's New Desktop Computers

Macintosh Color Classic •first-time buyers on a minimal budget, but who want a color Macintosh computer

•users who like its compact, all-in-one design and its transportability

•people who use a Macintosh elsewhere and want one for use at home

Macintosh LC III •users on a minimal budget, who want a modular, expandable color Macintosh and a wide choice of monitors

•entry-level business users (good configuration: Macintosh LC III and the full-page, grayscale Apple Portrait Display)

Macintosh Centris 610 •business users on a moderate budget

•business support and administrative staff

•university faculty members

•K-12 school administrators

Macintosh Centris 650 •business users who anticipate expanding their computers in the future

• users of QuickTime and desktop publishing

•faculty and students in technical disciplines

• power users

Macintosh Quadra 800 •users doing computationally demanding tasks, where speed greatly increases their productivity (high-end desktop publishing, computer-assisted design, scientific simulation)

•cost-sensitive users who don't need extra expandability of Quadra 950 (which offers five NuBus slots, built-in 24-bit color support, higher memory capacity, dual-

channel SCSI bus, more bays for internal mass-storage devices)

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Strategy/Desktop, Mac prices figure; Mar 93 *Apple Direct*

Legend:
(m)—includes built-in monitor
(k)—includes keyboard
(*)—may or may not include keyboard, depending on configuration
(shading)—new addition to product line

68030-based *68040-based*

Macintosh Desktop Computer Prices. *The points aligned vertically represent different configurations of the Macintosh described below. All prices are U.S. suggested retail prices as this article went to press; configurations and prices will be different in other parts of the world. The higher points representing more expensive versions of the same model contain more memory, a larger internal hard disk, and sometimes built-in Ethernet and/or the AppleCD 300i CD-ROM drive. The computers in the shaded areas were introduced on Feb. 10, 1993.*

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Macintosh Centris 610 and 650 Fact Sheet

	Macintosh Centris 610	**Macintosh Centris 650**
Micro proce ssor	• MC68LC040, running at 20 MHz • On-chip Page Memory Management Unit (PMMU) • Math coprocessor absent in MC68LC040 processor • On-chip data and instruction caches (4 KB each) • 32-bit data bus	• MC68040 or MC68LC040, running at 25 MHz • On-chip Page Memory Management Unit (PMMU) • Math coprocessor functions built into MC68040 but absent in MC68LC040 • On-chip data and instruction caches (4 KB each) • 32-bit data bus
Memo r y	• 4 MB memory on logic board, expandable to 68 MB via two 72-pin SIMM slots	• 4 MB memory on logic board, expandable to 132 MB via four 72-pin SIMM slots

| **Internal expansion** | • One internal expansion slot for either a 7-inch 68040 processor-direct slot (PDS) card or a 7-inch NuBus card
• Expansion slot requires a separate adapter for NuBus card
• Filled expansion bay for one internal 3.25-inch SCSI device (used for Macintosh Centris 610's internal hard disk)
• Empty expansion bay for one internal, half-height 5.25 device, with access to front panel of Macintosh Centris 610 (for removable-media devices)
• Can be ordered with AppleCD 300i CD-ROM drive installed in 5.25-inch expansion bay | • Internal expansion slot for a full-size 68040 processor-direct slot (PDS)
• 3 internal NuBus expansion slots
• NuBus backplane is compatible with NuBus 90 features, including 2x-faster clock rate of 20 MHz, double-rate block transfers between NuBus 90 cards (but not to/from main logic board), and IEEE P1394 high-speed serial bus—however, computer makes no use of these features
• Filled expansion bay for one internal 3.25-inch SCSI device (used for Macintosh Centris 650's internal hard disk)
• Empty expansion bay for one internal, half-height 5.25 device, with access to front panel of Macintosh Centris 650 (for removable-media devices)
• Can be ordered with AppleCD 300i CD-ROM drive installed in expansion bay |

Disk drive	• Built-in Apple SuperDrive 1.4-megabyte floppy disk drive; reads, writes, and formats Macintosh, MS-DOS, OS/2, and ProDOS disks • Built-in 80, 230, or 500 MB internal SCSI hard disk	• Same as Macintosh Centris 610

| **Video** | • Supports all Apple monochrome and color monitors, many VGA, SVGA, NTSC, PAL, and 19-inch monitors
• Comes with 512 KB of video memory, which supports Macintosh 12-inch RGB monitor with 16-bit color (32,768 colors), all other Apple color monitors up to 16-inch and Macintosh 12-inch Monochrome Monitor with 8-bit video (256 colors or shades of gray), larger color monitors with 4-bit color (16 colors), Macintosh Portrait Display with 4-bit video (16 shades of gray)
• With addition of another 512 KB of video memory, supports all Apple color monitors up to 16-inch with 16-bit color (32,768 colors), larger color monitors with 8-bit color (256 colors), Macintosh 12-inch Monochrome Display and Macintosh Portrait Display with 8-bit video (256 shades of gray) | • Same as Macintosh Centris 610 |

Back-panel ports	• Two RS-232/RS-422 serial ports (printer, modem) • SCSI interface, for external peripherals • AAUI-15 Ethernet connector (for models that come with optional Ethernet interface built in) • D-15 video connector • Monaural sound-in port • Stereo sound-out port • Built-in LocalTalk networking through serial port • Two Apple Desktop Bus (ADB) ports, supporting a keyboard, mouse, and other devices	• Same as Macintosh Centris 610
Keyboard and mouse	• Includes Apple Desktop Bus Mouse II • Compatible with ADB keyboards (sold separately)	• Same as Macintosh Centris 610
Sound	• Monaural sound-in port • Stereo sound-out port (working at 22 kHz sample rate)	• Same as Macintosh Centris 610
Electrical requirements	• Line voltage: 100–240 V AC, 47–63 Hz • Power: 210 W maximum	• Line voltage: 100–240 V AC, 50–60 Hz • Power: 325 W maximum

Size and weight	• Main unit: 16.3 in. (41.5 cm) x 3.4 in. (8.5 cm) x 15.6 in. (39.7 cm) • Weight: 14.0 lbs (6.4 kg); heavier when internal devices are installed	• Main unit: 13.0 in. (33.0 cm) x 6.0 in. (15.2 cm) x 16.5 in. (41.9 cm) • Weight: 25 lbs (11.3 kg); heavier when internal devices are installed
Other	• Includes and requires System Software 7.1 (and system enabler file) • Clock/calendar integrated circuit with long-life lithium battery • ADB devices should not draw over a total of 500 mA (Apple recommends three ADB devices maximum)	• Same as Macintosh Centris 610

Prices (U.S. Suggested Retail Prices)	• With 4 MB of memory, 80 MB hard disk, and 512 KB of video memory—$1,859 • With 8 MB of memory, 230 MB hard disk, 512 KB of video memory—$2,509 • With 8 MB of memory, 230 MB hard disk, 1 MB of video memory, Ethernet, and AppleCD 300i CD-ROM—$2,929 (Note: configurations and prices offered will vary in different countries)	• With 4 MB of memory, 80 MB hard disk, 512 KB of video memory, no math coprocessor, and Ethernet—$2,699 • With 8 MB of memory, 230 MB hard disk, 512 KB of video memory, math coprocessor, and Ethernet—$3,549 • With 8 MB of memory, 230 MB hard disk, 1 MB of video memory, math coprocessor, Ethernet, and AppleCD 300i CD-ROM—$3,969 (Note: configurations and prices offered will vary in different countries—some countries will offer this computer without Ethernet)

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Quadra 800 Fact Sheet

Microprocessor	• MC68040, running at 33 MHz • On-chip Page Memory Management Unit (PMMU) • Math coprocessor functions built into MC68040 • On-chip data and instruction caches (4 KB each) • 32-bit data bus
Memory	• 8 MB memory on logic board, expandable to 136 MB via four 72-pin SIMM slots

Internal expansion	• Internal expansion slot for a full-size 68040 processor-direct slot (PDS) • 3 internal NuBus expansion slots • NuBus backplane is compatible with NuBus 90 features, including 2x-faster clock rate of 20 MHz, double-rate block transfers between NuBus 90 cards (but not to/from main logic board), and IEEE P1394 high-speed serial bus—however, computer makes no use of these features • Filled expansion bay for one internal 3.25-inch SCSI device (used for Quadra 800's internal hard disk) • Empty expansion bays for one internal, half-height 5.25-inch SCSI device and one internal 3.25-inch SCSI device, both with access to front panel of Quadra 800 (for removable-media devices) • Can be ordered with AppleCD 300i CD-ROM drive installed in 5.25-inch expansion bay
Disk drive	• Built-in Apple SuperDrive™ 1.4-megabyte floppy disk drive; reads, writes, and formats Macintosh, MS-DOS, OS/2, and ProDOS disks • Built-in 230 or 500 MB internal SCSI hard disk

Video	• Supports all Apple monochrome and color monitors, many VGA, SVGA, NTSC, PAL, and 19-inch monitors
	• Comes with 512 KB of video memory, which supports Macintosh 12-inch RGB display with 16-bit color (32,768 colors), all other Apple color monitors up to 16-inch and Macintosh 12-inch Monochrome Monitor with 8-bit video (256 colors or shades of gray), larger color monitors with 4-bit color (16 colors), Macintosh Portrait Display with 4-bit video (16 shades of gray)
	• With addition of another 512 KB of video memory, supports all Apple color monitors up to 16-inch with 16-bit color (32,768 colors), larger color monitors with 8-bit color (256 colors), Macintosh 12-inch Monochrome Display and Macintosh Portrait Display with 8-bit video (256 shades of gray)
Back-panel ports	• Two RS-232/RS-422 serial ports (printer, modem)
	• SCSI interface, for external peripherals
	• AAUI-15 Ethernet connector (standard)
	• D-15 video connector
	• Monaural sound-in port
	• Stereo sound-out port
	• Built-in LocalTalk networking through serial port
	• Two Apple Desktop Bus™ (ADB) ports, supporting a keyboard, mouse, and other devices

Keyboard and mouse	• Includes Apple Desktop Bus Mouse II • Compatible with ADB keyboards (sold separately)
Sound	• Monaural sound-in port • Stereo sound-out port (working at 22 kHz sample rate)
Electrical requirements	• Line voltage: 100–240 V AC, 50–60 Hz • Power: 425 W maximum
Size and weight	• Main unit: 14.25 in. (30.6 cm) x 8.9 in. (19.6 cm) x 16.0 in. (40.6 cm) • Weight: 25.3 lbs (11.5 kg); heavier when internal devices are installed
Other	• Clock/calendar integrated circuit with long-life lithium battery • ADB devices should not draw over a total of 500 mA (Apple recommends three ADB devices maximum)
Prices (U.S. Suggested Retail Prices)	• With 8 MB of memory, 230 MB hard disk, 512 KB of video memory, and Ethernet—$4,679 • With 8 MB of memory, 500 MB hard disk, 1 MB of video memory, and Ethernet—$5,389 • With 8 MB of memory, 500 MB hard disk, 1 MB of video memory, Ethernet, and AppleCD 300i CD-ROM—$5,739 (Note: configurations and prices offered will vary in different countries)

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Macintosh LC III Fact Sheet

Microprocessor	• MC68030, running at 25 MHz • On-chip Page Memory Management Unit (PMMU) • Socket for optional MC68882 math coprocessor • 32-bit data bus
Memory	• 4 MB memory on logic board, expandable to 36 MB via one 72-pin SIMM slot
Internal expansion	• Internal Macintosh LC III processor-direct slot (PDS); its 114 pins make it a true processor-direct slot that includes a complete set of data and address lines • Macintosh LC III PDS accepts almost all Macintosh LC/LC II PDS cards; LC III PDS connector is superset of 96-pin LC/LC II connector
Disk drive	• Built-in Apple SuperDrive 1.4 MB floppy disk drive • Built-in 230 or 500 MB internal SCSI hard disk

Video

• Supports all Apple
monochrome and color
monitors up to 16-inch and
many VGA monitors
• Comes with 512 KB of video
memory (VRAM), which
supports Macintosh 12-inch
RGB display with 16-bit color
(32,768 colors), all other Apple
color monitors up to 16-inch
and Macintosh 12-inch
Monochrome Monitor with 8-bit
video (256 colors or shades of
gray), Macintosh Portrait
Display with 4-bit video (16
shades of gray)
• Standard 512 KB of video
memory also supports special
640 x 400 pixel, 16-bit video
mode on 13-inch color monitors
(smaller display, but shows
more colors without adding
expansion video memory)
• With addition of another 256
KB of video memory, supports
all Apple color monitors up to
14-inch with 16-bit color
(32,768 colors), the Macintosh
16-inch Color Display with 8-bit
color (256 colors), and the
Macintosh 12-inch
Monochrome Display and
Macintosh Portrait Display with
8-bit video (256 shades of gray)

Back-panel ports	• Two RS-232/RS-422 serial ports (printer, modem) • SCSI interface, for external peripherals • Video port for various color and monochrome displays (see above) • Monaural sound-in and -out ports • Built-in LocalTalk networking through serial port • One Apple Desktop Bus™ (ADB) port, supporting a keyboard, mouse, or other devices (can support multiple devices through daisy-chaining)
Keyboard and mouse	• Includes Apple Desktop Bus Mouse II • Compatible with ADB keyboards (sold separately)
Sound	• Monaural sound-in port • Monaural sound-out port (working at 22 kHz sample rate)
Electrical requirements	• Line voltage: 100–240 V AC, 47–63 Hz • Power: 30 W maximum
Size and weight	• Main unit: 12.2 in. (31.0 cm) x 3.2 in. (8.1 cm) x 15.0 in. (38.2 cm) • Weight: 8.8 lbs (4.0 kg); heavier when internal devices are installed
Other	• Clock/calendar integrated circuit with long-life lithium battery • ADB devices should not draw over a total of 200 mA (Apple recommends three ADB devices maximum)

Prices (U.S. Suggested Retail Prices)

- Includes and requires System Software 7.1 (and system enabler file)
- With 4 MB of memory, 80 MB hard disk, 512 KB of video memory, and Apple Standard Keyboard II—$1,379
- With 8 MB of memory, 160 MB hard disk, 512 KB of video memory, and Apple Standard Keyboard II—$1,699

Color That's Easy to Take

**The Macintosh Color Classic and the Macintosh
PowerBook 165c**

By Gregg Williams

Color—who *doesn't* want it? People respond to color instinctively—it brings them one step closer to visual reality and encourages them to see the image, not the computer. People also respond to color intellectually—when used to highlight important data, it helps people to notice and then focus on the data that makes a difference.

The Macintosh Color Classic makes color easy to take because it makes a no-compromise, compact color Macintosh available for $1,389 (U.S. suggested retail price). The Macintosh PowerBook 165c, though more expensive, makes it easy for you to take the full-color Macintosh experience wherever you go, in a compact, 7-pound PowerBook format.

This article presents overviews of both computers, both of which were announced at Macworld Expo/Tokyo on February 10. Look for more developer-oriented technical information in next month's *Apple Direct.*

MACINTOSH COLOR CLASSIC STRATEGY

The Macintosh Color Classic will be very compelling to many buyers because it combines the most popular features of the Macintosh LC line (color and expandability) with the most popular features of the Macintosh Classic family (compact size and affordability).

The Macintosh Color Classic Fact Sheet below gives detailed information on the Macintosh Color Classic, but here are the most important details about it: It costs $1,389 and has 4 MB of memory, an 80 MB hard disk, and a built-in Sony Trinitron 10-inch color monitor. (That's the current pricing for the configuration offered in the United States, at least. Other countries may offer different configurations at different prices.)

The Customer Is Always Right. When we surveyed low-end customers, we found what is important to them and how important each factor is. In order of decreasing importance, they are as follows:

• *Price.* The entry point is very important to these customers. They need complete systems in the $1,000–$2,000 range—the lower, the better.

• *Expandability.* Low-end customers are often first-time customers, too, and they're very aware of how little they know *and* how much money they're spending. They are nervous—and rightly so—about making a Big Mistake and buying a computer that will become obsolete overnight. Expandability is a necessary feature for them—they want to know they can add to their computer. And it turns out that slots are the best understood form of expandability, even when customers don't really know what slots are. That's one reason why the Macintosh Color Classic has a processor-direct slot (more on that later).

• *Color.* Who doesn't want color—especially when it's the no-compromise color of a Sony Trinitron 10-inch monitor?

• *Performance.* Although this is not a leading factor in a customer's decision, attractive IBM-compatible computers *are* Apple's competition in the marketplace, and customers are reluctant to buy something that's not seen as competitive. Also, if a computer doesn't offer a certain level of basic features, customers perceive it as "stripped down" and, as such, very close to being obsolete.

The Expandable Color Classic. The Macintosh Color Classic is expandable in five ways. First, it comes with 4 MB of memory and can be expanded to a total of 10 MB. Second, users can expand the Macintosh Color Classic by adding an optional 68882 math coprocessor. Third, the computer contains the standard complement of back-panel ports: a SCSI port, two serial ports, sound-in and sound-out ports, two Apple Desktop Bus (ADB) ports, which allow the connection of at least eight peripherals (six SCSI peripherals and two more from the serial ports). Fourth, the computer provides 8-bit color as standard and the option of expanding to 16-bit color by adding an extra 256 KB of video memory (VRAM). The fifth level of expandability is very important: The Macintosh Color Classic contains a processor-direct slot (PDS). And it's not *just* a PDS. It's the same slot design as in the Macintosh LC and LC II, so virtually all existing Macintosh LC PDS cards will work in it. This gives customers a variety of expansion options from the day they buy their Macintosh Color Classics.

No More "Crack the Case"! In the past, a user needed special tools (and almost superhuman self-confidence) to "crack open" a compact Macintosh computer to upgrade it. The Macintosh Color Classic changes all that: You can slide the main logic board out the back of the computer without opening the case itself!

This means that dealers and customers can get to the processor-direct slot, the math coprocessor chip socket, and the memory and video-memory SIMM sockets quite easily. In fact, it would also be easy—should Apple decide to do so—to offer a replacement board that would upgrade the entire computer!

More Features. A few more features deserve mention. Most important, Apple refused to compromise on the quality of the monitor, so the Macintosh Color Classic uses a 10-inch Sony Trinitron monitor. For users concerned about the level of electromagnetic radiation (EMR), the Macintosh Color Classic meets the strict SWEDAC MPR-2 requirements for low EMR emissions.

The Macintosh Color Classic is also the first personal computer to use the U.S. Environmental Protection Agency (EPA) Energy Star logo. Users can configure the Macintosh Color Classic to turn the video monitor off when the computer hasn't been in use recently. Doing so saves a tremendous amount of electricity (somewhere around 50 percent), cuts users' electricity bills, and reduces carbon dioxide emissions. (According to the EPA, the generation of electricity creates about 35 percent of all the carbon dioxide released in the United States.)

MACINTOSH POWERBOOK 165C STRATEGY

Even though the first PowerBooks entered an already established market, they took the world by storm, and rightly so—the Macintosh PowerBook computers raised the standard by which all notebook computers are compared. We expect the Macintosh PowerBook 165c to do the same because it adds a feature that every PowerBook user has wanted from day one: *color.*

Doing Color Well. The Macintosh PowerBook 165c brings color to the PowerBook family. But it doesn't just bring color to a notebook computer (others have done that); the PowerBook 165c brings *Macintosh color,* which means a lot more than just having 256 colors on the screen. It means color integrated deeply into the computer through Apple's QuickDraw system software. It means

the display of movies and other dynamic data through QuickTime. It means the reliable use of color from scan-in to printout through Apple's ColorSync color-matching technology. This is Apple's strategy of "added value" at its best—no other notebook computer has all these advantages, nor can any notebook deliver as rich and integrated use of color as the Macintosh PowerBook 165c does.

Good color isn't useful with-out good performance, and Apple engineers designed the PowerBook 165c to be just as snappy as its grayscale counterpart, the PowerBook 160. We've increased the processor speed by over 30 percent (from 25 MHz to 33 MHz) and added, as a standard feature, a Motorola 68882 math coprocessor chip. (The PowerBook 160 doesn't have one and can't be expanded to have one.)

Since color images use more disk space than their black-and-white counterparts, the PowerBook 165c ships with a larger internal hard disk (80 and 160 MB disks, as opposed to the 40, 80, or 120 MB hard disks inside the PowerBook 160). Like the PowerBook 160 and 180, the Macintosh PowerBook 165c can hold up to 14 MB of memory (up from 8 MB on the PowerBook 145 and earlier models).

Superior Passive-Matrix Color. To anyone who might think of the PowerBook 165c as a second-class product because of its passive-matrix display, we say simply: Take a look at the PowerBook 165c before you judge it. Apple worked with its suppliers to produce a passive-matrix color display that is brighter and more vivid than all the passive-matrix displays that you've seen on DOS notebook computers.

The PowerBook 165c display incorporates numerous improvements over previous technologies. A new polarizer layer in the liquid-crystal display (LCD) gives the PowerBook 165c a wider viewing area and better contrast ratio. A new LCD-material layer reduces the washout of the image because of ambient light. Two cold-fluorescent lamps, one each at the top and bottom edges of the LCD, help make the colors brighter. And the PowerBook 165c uses a gamma table to match the LCD's colors to the desired colors in the RGB color space.

Of course, all this extra performance doesn't come for free. After all, this color LCD panel has *three* times as many LCD junctions as any other PowerBook, because each color pixel needs three junctions—red, green, and blue—and the two-bulb backlighting needs more power than previous one-bulb designs.

So it should come as no surprise that battery life for the PowerBook 165c is not *up.* But it's not bad: The Macintosh PowerBook Rechargeable Battery (the same as is used by all the other non-Duo PowerBooks) is rated at lasting 1.5 to 2 hours in a Macintosh PowerBook 165c before needing to be recharged. Would you pay that price to have a color PowerBook? As far as I'm concerned, you don't even need to ask the question.

The Ultimate Color PowerBook? Of course not—the PowerBook 165c is a great color PowerBook, but it's also Apple's *first* color PowerBook. Apple's intent (for both desktop and notebook computers) is to enhance the feature sets of its products *constantly* so as to give its customers the best value possible for their money. (This is what Apple did when it replaced the Macintosh PowerBook 140 with the faster Macintosh PowerBook 145 and the Macintosh Quadra 900 with the faster Macintosh Quadra 950.)

Who wants color? Everybody. Who *needs* it? More people than you think. Many programs—word processors, spreadsheets, databases—can benefit from color. Many others—graphics and presentation programs, for example—*depend* on it. With the PowerBook 165c, anything you otherwise would have been doing on your desktop Macintosh, you can now do anywhere—in a client's office, at the airport, at home—*anywhere.* ◆

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Executive Summary

The Macintosh Color Classic computer brings the full compact Macintosh experience to customers for the most affordable price ever—a U.S. suggested retail price of $1,389. It does so without giving up the quality that Macintosh users have come to expect: the Macintosh Color Classic uses a 68030 processor running at 16 MHz, 4 MB of memory, an 80 MB internal hard disk, and a high-quality Sony Trinitron video monitor.

The Macintosh PowerBook 165c makes the PowerBook even better with its use of a color display. Apple worked closely with the suppliers of the passive-matrix color liquid-crystal display (LCD) it uses to ensure that the Macintosh PowerBook 165c's display is brighter and more vivid than those of today's passive-matrix color LCDs. This PowerBook's color LCD and backlighting

consume more energy, so batteries don't last quite as long—each PowerBook battery should last from 1.5 to 2 hours.

For technical details about these computers, see next month's *Apple Direct.* ◆

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Macintosh Color Classic Fact Sheet

Microprocessor	• MC68030, running at 16 MHz • On-chip Paged Memory Management Unit (PMMU) • Socket for optional MC68882 math coprocessor • 16-bit data bus
Memory	• 4 MB memory on logic board, expandable to 10 MB through two 30-pin SIMM slots
Internal expansion	• One processor-direct slot (PDS) that uses 96-pin LC-compatible PDS boards (including Apple IIe Card, Apple Ethernet LC Card) • Slide-out logic board makes it easier for users, dealers to upgrade memory, video memory, PDS, or computer itself
Disk drive	• Built-in Apple SuperDrive 1.4 MB floppy disk drive; reads, writes, and formats Macintosh, MS-DOS, OS/2, and ProDOS disks • Built-in 40, 80, or 160 MB internal SCSI hard disk (different countries will offer different configurations)

Video	• Built-in 10-inch Sony Trinitron color monitor, 512 x 384 pixels (0.26 mm stripe pitch, 76 dots per inch) • Built-in video circuitry uses separate 256 KB video memory for 8-bit color; expandable to 512K video memory for 16-bit color by adding one 256 KB video memory SIMM • 16-color, 560 x 384 pixel mode available if an Apple IIe Card is installed in the processor-direct slot (PDS)
Back-panel ports	• Two Apple Desktop Bus (ADB) ports, supporting a keyboard, mouse, and other devices • Two RS-232/RS-422 serial ports (printer, modem) • SCSI interface, for external peripherals • Monaural sound-in and sound-out ports • Built-in LocalTalk networking through serial port
Keyboard and mouse	• ADB keyboard (with numeric keypad) and mouse
Sound	• Monaural sound • Built-in microphone • High-quality internal speaker for multimedia and entertainment applications
Electrical requirements	• Line voltage: 90–240 V AC, 47–63 Hz • Power: 100 W maximum
Size and weight	• Main unit: 14.5 in. (37.0 cm) x 9.9 in. (25.2 cm) x 12.6 in. (32.2 cm) • Weight: 22.5–23.2 lbs (10.2–10.5 kg), depending on configuration
Other	• Includes and requires System Software 7.1 (and system enabler file) • Power-saver mode (turning monitor off when not in use) reduces power consumption by over 70 percent • Negative-pressure fan

Price (U.S. suggested retail price)
• With 4 MB of memory, an 80 MB hard disk, 256 KB of video memory, and an Apple Standard Keyboard II, $1,229 (Note: configurations and prices offered will vary in different countries)

Macintosh PowerBook 165c Fact Sheet

Microprocessor
• MC68030, running at 33 MHz (can also run in 16-MHz power-saving mode)
• MC68882 math coprocessor, running at 33 MHz

Memory
• 4 MB of pseudostatic memory (PSRAM) on the main logic board and one internal memory expansion slot
• Expandable to up to 14 megabytes of memory using a single memory expansion card
• 1 MB of ROM

Disk drives
• One internal 80 or 160 MB SCSI hard disk
• Built-in Apple SuperDrive 1.4 MB floppy disk drive; reads, writes, and formats Macintosh, MS-DOS, OS/2, and ProDOS disks

Internal video display
• Built-in 9-inch (226 mm) diagonal color passive-matrix liquid-crystal display (LCD)
• 640 by 400 pixels
• Displays 256 colors out of a palette of 4096
• Refresh rate: 75 Hz
• Response time: 400 ms

External video display
• Built-in support for external color monitors up to 16 inches (256 colors) and grayscale monitors (16 gray levels)
• Supports Apple monitors up to and including the Macintosh 16-inch Color Display

Battery
• Nickel cadmium battery
• With the EverWatch Battery Saver technology, provides 1.5 to 2 hours of use before recharge needed

Keyboard
• Built-in 63-key keyboard with standard Macintosh layout (64 keys in international version)
• Two-level tilt adjustment

Trackball
• 30-mm diameter dual-button trackball

Interfaces	• Two serial (RS-422) ports for LocalTalk networking, printers, modems, and other devices • Port for optional modem • Apple Desktop Bus (ADB) port • HDI-30 port for SCSI peripherals • Video-out port • Sound-in and sound-out ports • Hole for antitheft device
Electrical Requirements	• Line voltage: 110–220 volts AC at 50–60 Hz
Size and weight	• Size: 9.3 in. (23.6 cm) x 11.25 in. (28.6 cm) x 2.29 in. (5.8 cm) • Weight: 7.0 lb. (3.2 kg)
Other	• Includes and requires System Software 7.1 (and system enabler file) • Optional PowerBook Express Modem: communicates at 14,400 bits per second (bps) for data, 9600 bps for sending and receiving faxes; includes Express Fax software • Battery and AC adapter • Security slot, for use with third-party equipment to prevent theft
U.S. suggested retail prices (not final at press time)	• $3,399 (with 4 MB of memory and an 80 MB hard disk) • $3,759 (with 4 MB of memory and a 120 MB hard disk)

CD Highlights

We are pleased to send you *Other People's Memory,* the March issue of the Developer CD Series. But before I describe its contents, I'd like to tell you about some exciting new developments with the Developer CD.

Beginning with the next mailing, the April monthly mailing, to be precise, we will greatly increase the quality and expand the quantity of materials we deliver you. Once upon a time, not so long ago, the capacity of a single CD—650 MB—seemed like a limitless amount of space. Last year, however, we completely filled each CD and were unable to include all valuable material because of space constraints. This included international system software, multimedia materials, tools, and documentation. Our new strategy will triple our capacity—delivering you an additional 1.3 gigabytes of data each quarter.

Starting next month the content of each Developer CD will focus on one of three areas: system software, tools and applications, and technical documentation. Each disc will include an expanded range of content in its focus area, while still containing a What's New folder with new and updated items in all three areas. This increases the amount of material we provide, *yet continues to ensure that you never have to wait more than four weeks for the latest new items in any area.*

How will this work? You'll continue to receive a new Developer CD each month, but the disc's contents will rotate among the three areas. One month, the disc will contain mostly system-software–related materials; the next month, mostly tools and applications; the third, mostly technical documentation.

To make this a bit clearer, here's what the next three months' CDs will look like.

April Developer CD—System Software Edition: Our new strategy kicks off next month, when you'll receive the first System Software edition of the Developer CD. In addition to new materials from all three areas, the disc will contain almost 500 MB of worldwide system software—the most comprehensive collection ever published by Apple. Here you will find both network installation software and disc images for the latest U.S., European, Middle Eastern, and Asian system software. Language modules, system enablers, WorldScript, QuickTime, as well as new system software components will also be released on this disc.

As with previous CDs, the What's New folder on the April Developer CD will contain the latest releases of new system software as well as new tools and applications and technical documentation. Remember, you will never have to wait more than four weeks for new information, regardless of the category.

May Developer CD—Tools & Apps Edition: This disc will include an expanded collection of tools and applications in the areas of devices and hardware, graphics and imaging, INITs, localization tools, utilities, networking and communications, OS/Toolbox, and testing and debugging. Among the new items included on this disc will be beta versions of new technologies as well as other previously restricted materials.

We hope you will be delighted with the range and quality of new items on this edition of the Developer CD. This month's disc should provide you with a solid, comprehensive head start at integrating new Apple technologies into your products. More about the contents of this disc will be announced in next month's "CD Highlights."

Again, the What's New folder on the May Developer CD will be similar in format to previous CDs and will also include any system software or technical documentation released since the publication of the April disc.

June Developer CD—Technical Documentation Edition: New technical documentation is growing rapidly. The first edition of this disc will contain 450 MB of technical documentation, including a number of submissions that have never before been available on the Developer CD. Much of this documentation, which includes an electronic version of *develop,* the Apple Technical Journal, will be available in Apple DocViewer format for easy reading and navigation. Stay tuned for details in upcoming "CD Highlights" columns.

The What's New folder on the June Developer CD, as on the April and May discs, will contain newly released system software and tools and applications.

Beyond June… This cycle of alternating content editions will continue on a quarterly basis, so you can expect a new System Software edition in July, a Tools & Apps edition in August, and a Tech Docs edition in September; then the cycle will repeat.

While you now must juggle three editions of the Developer CD on your servers, the technical and business

advantages offered by the expanded content should outweigh any initial awkwardness.

The March Developer CD: *Other People's Memory.* Now let me tell you about some of the great new materials on this month's CD.

Multimedia Standards Reports: Thanks to Rita Brennan in Apple's Standards group, we are able to bring you several reports about standards, including the EIA Mini-Conference Report, Multimedia Standards Report, Multimedia Standards Report-ISO, SGML Products on the Macintosh, and the SGML SIGHYPER (HYTIME) Report.

The *Human Interface Review:* Another thank you, this time to Tom Erickson in the Human Interface Group, for submitting a developer version of the *Human Interface Review.* This periodical discusses products, interfaces, research, and other issues of interest to those involved in interface-related work. PLEASE NOTE: these are not official guidelines in any sense! The review's purpose is to stimulate thought by calling attention to news, products, and research of importance.

Apple Style Guide: Here is the latest version of the *Apple Publications Style Guide,* an alphabetical compilation of style and usage rules for anyone writing or editing documentation for the Macintosh or related products. Features include guidelines on phrasing, capitalization, and usage for user and technical manuals and on-screen training. A supplement, "How to Write Balloons," is included.

Developer Notes: Along with our regular archive, you will find new developer notes for the Macintosh Color Classic, Macintosh LC III, the PowerBook 165c, Macintosh Centris, and Macintosh Quadra 800.

ESD Tech Notes: ESD Technical Notes contain the latest bugs, tips, and tricks for folks developing software for AppleTalk Remote Access, DAL, and SNA•ps. New Tech Notes included with this disc are *DAL23 Select for Extract, DAL24 Writes Fail After Reboot,* and *SNA•ps13 Admin Trace v1.1.1.*

Macintosh Tech Notes (Text): Also see our new selection of Macintosh Technical Notes: *Math Function Q&As, Mac Quadra Built-In Video, PAP Status Buffer,* and *Gestalt & SysEnvirons.*

Programmer's Guide to Apple Scanners: The *Programmer's Guide to Apple Scanners,* second edition, is a complete revision of the original manual incorporating detailed information on the Apple Color OneScanner, including driver calls and SCSI commands.

Apple Color OneScanner: The Apple Color OneScanner folder provides you with all the software you need to develop programs for all Apple scanners including the new Apple Color OneScanner. This folder contains Apple Scanner Driver 3.0, interface files, and a Read Me file. These materials are meant to be used in conjunction with the above-mentioned *Programmer's Guide to Apple Scanners.*

ColorSync 1.0.1: This version of Apple's color-matching architecture for the Macintosh has been updated to meet the requirements of new Apple CPUs.

MegaMovies 1.6.2: This test tool application demonstrates the use of the standard movie controllers and their manipulation of movie files. The tool tests functions that integrate QuickTime with other system software components.

Virtual Sphere 1.0: Virtual Sphere 1.0 includes the paper "A Study in Interactive 3-D Rotation Using 2-D Control Devices" as well as sample code and a C implementation of the Virtual Sphere interface for performing 3-D rotation. This package is not meant to provide official guidelines in any sense. It is strictly for information and educational purposes only.

APDA—Tools for Developers: Last but not least, we have included a new folder of APDA information and tools. APDA is Apple's worldwide source for over 300 development products. Check out the wide range of Apple and third-party products. Product, price, list, and ordering information are included for your convenience.

As always, let us know what you think (on AppleLink, we're at DEV.CD), and stay tuned for the new System Software edition of the Developer CD.

Sharon Flowers
Developer CD Product Manager

Apple Direct Wins STC Awards

Apple Direct has won an award of merit from the Society of Technical Communication in its recently completed Northern California Publications and Arts Competition.

 Apple's developer newspaper was recognized in the category of House Organs. It was judged against seven other publications, of which two won awards. Awards are given at four levels: Distinguished, Excellence, Merit, and Achievement.

 Also awarded by the competition's judges was *Apple Direct* Technical Writer and Editor Gregg Williams for three of
his articles. In the Trade and News Articles category, "Personal Printing" from the March 1991 issue and "The Power PC in Your Future" from July 1992 each won an award of Excellence, while "Blueprint for the Macintosh" (April 1992) received an Achievement
award. ◆

GrayShare and LaserWriter Pro 600/630 Corrections

The page-one Strategy article in February's *Apple Direct,* "Apple's New Imaging Products," contained two minor errors that we'd like to correct.

The article states that Apple's GrayShare printing technology allows 68000-based Macintosh models to print grayscale images. This is incorrect. Color QuickDraw must be present before a Macintosh can print grayscale images—this requires a Macintosh with a 68020 or 68030 processor (a Macintosh II computer or later).

The article also says that the LaserWriter Pro 600 and 630 are the first Apple LaserWriters to contain Adobe PostScript Level 2. In fact, three previously-released LaserWriters contain PostScript Level 2, specifically the LaserWriter IIf and IIg and the Personal LaserWriter NTR.

We regret any confusion these inaccuracies might have caused. ◆

Award-Winning *develop:* Issue 13 Now Available

develop, The Apple Technical Journal, has just received the 1992 award for excellence in its category by the Society for Technical Communication. The journal was praised by the judges for its ability to provide highly technical and complex subject matter in an enjoyable and informative manner. We hope you agree.

Issue 13 of *develop* is now available, electronically on this month's Developer CD, *Other People's Memory*, and in print from APDA. (See Now Available From Apple in the APDA folder for APDA ordering information.) It's full of programming tips and techniques about asynchronous routines, QuickTime, components, palettes, Macintosh debugging, and printing using QuickDraw GX.

•"Asynchronous Routines on the Macintosh" tells how to avoid the pitfalls of calling routines asynchronously.

•"Inside QuickTime and Component-Based Managers" gives useful debugging and tracing techniques for QuickTime and the Component Manager.

•"Macintosh Debugging: The Belly of the Beast Revisited," is a supplement to a debugging article in *develop* Issue 8 that explains four new debugging tools.

•"Adventures in Color Printing" provides a general strategy for printing color images that ensures the best possible quality.

•"DeviceLoop Meets the Interface Designer" describes a little-known System 7 routine that can help you deal with multiple screen environments.

•"Looking Ahead to QuickDraw GX" describes some points to be aware of involving QuickDraw GX and its effect on printing.

•"The Palette Manager Way" takes the mystery out of the Palette Manager.

•"Top 10 QuickTime Tips," the first installment of a new column on QuickTime, gives hot tips from the masters.

There's also Dave Johnson's thoughts on programming languages versus natural languages, KON & BAL's popular but challenging Puzzle Page, and a Q&A section in which the dogcow figures prominently.

Don't pass up this valuable, entertaining, award-winning resource. And please don't forget to tell us what you think about it; we really want to hear from you at AppleLink DEVELOP.

Caroline Rose, Editor
develop

Editor's Note: Hitting Our Stride

Apple has just received a vote of support from an unexpected source. Jim Seymour, a well-respected PC analyst who, by his own admission, has "roughed up" Apple before, wrote in *PC Week* last month:

> Apple is much stronger than it has ever been, and it is positioned superbly for the rest of the decade.

To support his point, Mr. Seymour cites several "facts" (to use his word), including:

- Apple has a "smash" success with the PowerBook
- Apple's financials are "sensational"
- "Apple bets on itself. Name another PC hardware firm spending $600 million-plus a year on R&D"
- John Sculley's commitment to the PDA positions us as "the innovation leader in the PC industry"

All we can say is thanks, and that we agree. In fact, it seems to me that we're just hitting our stride with the Macintosh.

Macintosh has always been a great general purpose personal computer that, thanks to its operating system and all the software available for it, can be put to a multitude of uses. What's made it so great? Sophisticated technology that provides a satisfying user experience, one that's so satisfying that for two years in a row Apple has finished first in the J.D. Power customer-satisfaction survey.

Since that technology and user interface were invented, Apple has been busy turning them into products. First as the 128K, then as the 512, SE, II, and so on, Macintosh technology found its way inside increasingly powerful, flexible computing products, products that were highly attractive, but only to a small segment of a vast market.

Until only recently, the products were positioned to sell to a general market. The same Macintosh that could be used for high-end desktop publishing might also end up in the home or school. It was really the application software that made the Macintosh a product with a specific use.

But that's beginning to change, and it's going to change even more. We're seeing a literal explosion of Macintosh "productizing," and we're seeing Macintosh products designed with specific uses for specific parts of the market. There's the Macintosh Performa line for consumers, the Macintosh Quadra 950 for high-end business users, the Macintosh PowerBook and PowerBook Duo for businesspeople on the go, ColorSync and the color scanner and printer for people who need to print in color.

Apple is defining untapped segments of the market and devising plans to reach those buyers. New Macintosh products are being built with technology that's appropriate for the part of the market they'll be sold to, and they're being priced accordingly. As our feature story this month puts it, there'll be a Macintosh for every pocketbook.

New system software extensions will help users and developers customize the Macintosh computing experience and devise uses for the computer that, until now, were simply inconceivable.

When you think of most products, don't you usually buy them because of the job they're supposed to do rather than the technology inside them? We buy toasters to make toast, not because they employ a heating element. We buy radios to listen to music or the weather, not because we like transistors. And we buy cars so we can drive, not because they rely on a carburetor.

Macintosh has thrived in part because people do buy it just because it's a Macintosh. The future of Macintosh—one that Apple is betting will greatly increase our share of the market—rests, though, in making it more like other products: something with an obvious, specific use the moment you open up the box.

It could be said that until now, Macintosh has been a great idea; now, Macintosh is becoming a family of great products. And with new technologies like AOCE, AppleScript, PowerPC, and a few I can't even mention yet, who knows where it will end?

Despite all this, there remain a few who say Macintosh is on its way out. That's like saying that the automobile as a concept was on the decline when Henry Ford diversified his product line with the Model A, the successor to his first car, the Model T. Maybe back then some analysts argued that anyone who would ever want a car already owned a Model T. Perhaps they suggested that the small percentage of the transportation market that enjoyed the ease of use and flexibility of a car would dwindle. Instead, these analysts said, car users would

join the vast majority who looked out the Windows as they rode in trains and boats or suffered with the bumpy performance of a horse or bicycle.

Paul Dreyfus
Editor

Apple Releases Performa in Europe

Apple Computer's new line of Macintosh computers offering solutions for home users was released in Europe in January. The Macintosh Performa 200, 400, 600, and 600 CD were made available in approximately 1,000 retail locations in Sweden, Germany, Belgium, Holland, France, and Switzerland. The new line will soon be made available in other countries, as well.

The Macintosh Performa line of computers, successfully launched last fall in the United States, is designed to reach first-time buyers and new users in the home, offering a specific solution for families with school-age children as well as home business users.

Shipped installed with an optimized version of System 7 called System 7.1P, the Performa computers can be turned on and used right out of the box without any special installation or set-up. System 7.1P is designed to make using the Macintosh even easier for first-time computer buyers.

Each Macintosh Performa computer is bundled with at least one integrated application to provide word-processing, spreadsheet, database, graphics, and communications capabilities in a single package. In addition, Performa buyers can take advantage of 90 days of toll-free telephone support (although this varies from country to country) and a one-year warranty.

The Performa computers will be sold in retail channels in Europe, including general merchandise stores, consumer electronics outlets, and office product superstores.

For more information on the Macintosh Performa computers, see the September issue of *Apple Direct* (available electronically on the Developer CD, *Other People's Memory;* path—Periodicals:Apple Direct). ◆

PowerPC Development Update

The Apple PowerPC development team has passed four significant development milestones in the past six months in bringing a PowerPC-based Macintosh to market on schedule in the first half of 1994.

First was the September arrival of the PowerPC 601 chip, the new version of IBM's popular RISC workstation chip that was jointly developed by Motorola, IBM, and Apple. The chip itself was a boost to the development schedule because, for first silicon, it was remarkably solid.

Next using the first chips, the PowerPC team was able to test Macintosh system software running on the new 68020 emulator in late September. The emulation software allows a PowerPC Macintosh to emulate a Motorola 68020 processor and run existing 68000 software. Through emulation, the team was able to run the Finder on the 601 chip and run extensive third-party applications. Even at this early stage, the quality of the emulator was excellent.

The third milestone came in mid-October, when the development team demonstrated a prototype of mixed-mode software running on the 601 chip. Mixed mode allows software to make calls either to the PowerPC instructions or the 68020 emulator. This way, an application can run on the emulator, or be compiled directly to PowerPC and take advantage of the increased performance.

A demonstration of a native Macintosh application running on a PowerPC-based Macintosh was the fourth breakthrough. In early November, the team took a small test application that runs on the 680x0 and recompiled it in MPW to 601 code. Not only did the native version run faster than before, but there were few changes required to move to PowerPC.

With the progress to date, the PowerPC-based Macintosh is on track to catapult Macintosh into the next decade. At the Worldwide Developers Conference in May 1993, you can look forward to finding out more about the next generation of Macintosh and the new opportunities that it will open to them.

Apple Direct will continue to keep you up-to-date on the PowerPC platform throughout the coming year so you can take advantage of it as soon as it is available.

For more information on what you can be doing to prepare for PowerPC, see "The PowerPC in Your Future" feature story in *Apple Direct* in July 1992. ◆

Now Available From Apple

The following list shows APDA products that have become available to developers within the last several weeks. To get a full listing of all APDA products, check the current *APDA Tools Catalog.* For new product announcements and the most up-to-date price lists, check AppleLink (path—Developer Support:Developer Services:Apple Information Resources:APDA—Tools for Developers).

Apple Products

Books
Network Solutions Guide
M6198/D
$17.95

Technical Resources
Intermediate Macintosh Application Programming
R0438LL/A
$495.00
Introductory Price $395.00

Tools
DAL Client
Various License Fees & Part Numbers
Call Apple Software Licensing for additional information:
(408) 974-4667

MacOSI XTI Developer's Kit
R0249Z/A
$500.00

VISCA Driver version 1.2
R0111LL/B

$50.00

Third-party Products

MacWireFrame
T0560LL/A
$299.00

Ordering Information

To place an APDA order from within the United States, contact APDA at (800) 282-2732; in Canada, call (800) 637-0029. For those who need to call the U.S. APDA office from abroad, the number is (716) 871-6555. You can also reach us via AppleLink; the address is APDA. If you're outside the United States, you may prefer to work with you local APDA contact. For a list of non-U.S. APDA contacts, see the "International APDA Programs" page in the *APDA Tools Catalog.*

Hot Product of the Month

Special limited-time offer!

New! QuickTime 1.5 Software Development Kit and QuickTime for Windows Software Development Kit

Order the QuickTime Macintosh and Windows Software Development Kit Bundle before May 15, 1993, and save $100!

QuickTime is Apple's revolutionary system software architecture that manages time-based data—providing endless possibilities for software developers to support multimedia in their applications.

New software development kits are available to meet your QuickTime development needs on the Macintosh, and now, the Windows platform. You'll save development costs and time and eliminate the need to support multiple programming interfaces.

Special offer
New! *QuickTime Macintosh and Windows Software Development Kit Bundle*
Order this bundle before May 15, 1993, and save $100 off the regular price. QuickTime for Windows is an implementation of the QuickTime architecture for the Microsoft Windows environment. This bundle includes both the Macintosh and Windows QuickTime Software Development Kits, allowing you to create applications on both platforms. These developer kits enable software vendors to publish ISO-format CDs containing files that can be played on both Macintosh and PC platforms. The Windows Kit provides an API identical to that of the Macintosh, making it easier for programmers who are already familiar with adding QuickTime support to their applications.
   Product contents: An ISO-format CD-ROM with Dynamic Linked Libraries, sample applications and source code, movie files, and on-line documentation and help; six DOS-based disks containing a subset of the CD-ROM for users with no CD drive; *QuickTime for Windows Programmers Manual; QuickTime 1.5*

Manual, QuickTime Components Manual, one QuickTime 1.5 CD-ROM, one Kodak Photo CD-ROM.

B0995LL/A Regular price $495.00 **Special offer $395.00 (U.S.)**

Other New QuickTime Development Products

New! *QuickTime for Windows Software Development Kit*

   Product contents: An ISO-format CD-ROM with Dynamic Linked Libraries, sample applications and source code, movie files, and on-line documentation and help; six DOS-based disks containing a subset of the CD-ROM for users with no CD drive; *QuickTime for Windows Programmers Manual.*

R0453LL/A $295.00 (U.S.)

New and powerfully improved! *QuickTime for Macintosh 1.5 Software Development Kit*

Substantially more powerful and versatile than version 1.0. Improvements include movies that play larger and faster; movies that play better from CD-ROM discs and EtherTalk networks; Kodak Photo CD support; text and derived media types, hardware support for full-screen, glitch-free 30-fps movies, and improved user interface.

   Product contents: QuickTime 1.5 Manual, QuickTime Components Manual, QuickTime 1.5 CD-ROM, and a Kodak Photo CD-ROM.

R0147LL/B $295.00 (U.S.)

QuickTime for Macintosh 1.5 Update Software Development Kit

Update for QuickTime Development Kit 1.0 owners only. See QuickTime for Macintosh 1.5 Software Development Kit for new product features.

   Product contents: QuickTime 1.5 Manual, QuickTime Components Manual, QuickTime 1.5 CD-ROM, and a Kodak Photo CD-ROM.

R0456LL/A $150.00 (U.S.)

QuickTime for Macintosh 1.5 Documentation Kit

Hard-copy versions for developers wanting additional documentation.

   Product contents: QuickTime 1.5 Manual, QuickTime for Components Manual.

R0455LL/A $99.00 (U.S.)

QuickTime Movie Exchange Toolkit Version 1.0

Convert multimedia application data created on other platforms to QuickTime movies playable on a Macintosh. Toolkit includes applications for many computers that let you easily create a QuickTime movie with both sound (8-bit) and images (8-bit and 24-bit).

   Product contents: Three Macintosh disks and the *Movie Exchange Toolkit Reference Manual.*
R0190LL/A $79.00 (U.S.)

QuickTime Programming Tutorial

Convert multimedia application data created on other platforms to QuickTime movies playable on a Macintosh. Toolkit includes applications for many computers that let you easily create a QuickTime movie with both sound (8-bit) and images (8-bit and 24-bit).

   Product contents: Three Macintosh disks and the *Movie Exchange Toolkit Reference Manual.*
R0456LL/AS $150.00 (U.S.)

Spotlight On...

Tools for commercial developers

SCSI VIEW

With SCSI View you can capture SCSI Manager traps and view them in convenient formats. The circular buffer allows continuous or one-shot captures. Since multiple shots can be open, various documents can capture and report at one time. You can view SCSI activity by command or by trap.
APDA Product Number: T0562LL/A $165.00

MACWIREFRAME 4.0

MacWireFrame is a library of 3-D wire-frame rendering tools that can be called from any application. MacWireFrame's tools provide isometric, top, front, side, and custom view perspectives as well as rotation on any axis. It includes a graphics editor for stand-alone operation, testing, and prototyping. The manual features an introduction to 3-D object modeling.
APDA Product Number: T0560LL/A $299.00

It Shipped!

Through the It Shipped! program, you can announce new and revised third-party products in *Apple Direct.* It Shipped! listings are also made available on the 3rd Party Connection AppleLink bulletin board. You can obtain an It Shipped! application by downloading it from the AppleLink network (AppleLink path—Developer Support:Developer Services:Apple Information Resources:Developer Program Information:It Shipped! @ Program). Or call Todd Luchette at (408) 974-1241 (voice) or (408) 974-3770 (fax).

Once you've completed the application, send it to Engineering Support, Apple Computer, Inc., 20525 Mariani Ave., M/S 42-ES, Cupertino, CA 95014, Attn: It Shipped! Program. Or send it by AppleLink to IT.SHIPPED.

These products shipped in January, 1993.

Publisher	Product (version)
4-Sight (International) Ltd	4-Sight Fax 2.4
Affinity Software Corporation	Medical InfoManager 5.0.1
Alpha Technologies Group, Inc.	QuickTime Media Clips (CD-ROM)
By Design, Inc.	DATICA 1.1
CE Software, Inc.	QuicKeys Test Drive 1.0
Cordillera Press, Inc.	The Outdoor Athlete 1.0
CRA Z Software	KopyKat 1.0.0
Davis Instruments	Weatherlink for Macintosh 1.0
Image Club Graphics, Inc.	LetterPress CD ROM 3.0
Insight Development	MacPrint/Portable 1.3.2
IntelliGenetics, Inc.	BaseWorks DNA Sequencing Software 1.0
	FilmMate Film Scanner
	FilmMate Film Scanner Software
Interactive Solutions, Inc.	MovieWorks 1.0

Language Engineering Corp.	LogoVista E to J
Macplay	Out of This World 1.0
MapInfo Corporation	MapBasic for Macintosh 2.0
	MapInfo for Macintosh 2.0
Mountain Lake Software	MakeTest 2.0.1
n Dimensions Software House	DeeMaker for DeeManager 1.2
Palomar Software	On The Road
Revelar Software	ConstructionMac! 2.0
SensArray Corporation	Thermal MAP System
Seven Hills Software	Drive Cleaner 1.1
ShadeTree Marketing	FRAAMZ 1.0
Software Mart	Whale Of A Tale
Sterling Swift Software	StoCARics 1.0
Strategic Mapping	Local Expert 1.1
Synergy Software	Versatilities 1.0
Useful Software Corporation	Useful Voice Processor for Macintosh 1.1v2
Xplain Corporation	All of MacTech Magazine CD-ROM Vols. 1–8

Ban the Bomb

By Peter Bickford

Dear Peter,
Thanks for a well-written and interesting article. I'd like to throw some more logs on the fire. In your article you ask, "Would you buy a used car from this dialog box?" —Well, what about these two from System 7.1? First, "An unexpected error has occurred, because an error of type 15 occurred."
  (Comments: Aren't errors generally "unexpected"? I don't know any user who on purpose creates system errors just for the fun of it. And, what the #?@% is an error of type 15? And more important, what am I, as a common user trying to upgrade my system software, supposed to do with this piece of information? I assume it is provided with some purpose in mind.)
  Second, "The object 'Desktop' (folder) could not be opened."
  (Comments: Aaah, so what? Again, what am I supposed to do? Isn't that what you, the designers and experts should tell me?)
  Get me right here, Peter. I love the Mac, I live from it and I have been using it since 1985, but system error messages are at best a joke and often an insult. I would really like to see someone make a mission of improving the human interface of system errors and error messages.
  I think that getting this bit of the human interface up to a level of the Macintosh way of communicating with a human user (not an operating-system programmer) is long overdue and really deserves some serious attention.
  This is written with one purpose alone—to contribute to making a very good machine with a wonderful human interface an even better communicator.
  Best regards,
  I. E.

(Editor's note: We've provided only the writer's initials to protect the innocent.)

Golly, I.E., you mean you don't know what a type 15 error is?
  It's all really quite simple: Just turn your secret decoder ring to the first letter on page 365 of *Inside Macintosh,* Volume II (the old version), and you'll see from the crypto-DSAT table that a type 15 error indicates that a dsLoadErr (Segment Loader Error) has occurred. I'm glad I could clear that up for you—but then

again, that's what this column is here for. So just resolve that error in the usual way and get back to work, OK?

   —Doc

   P.S. Since we had to explain type 15 errors publicly, I'm afraid we're going to have to change all the codes. You can obtain a new decoder ring from your usual contact.

MINIMIZE
DAMAGE

But seriously, folks, it's time we brought light to that darkest area of the human interface: the error message. Because, like it or not (and we don't!), error messages are part of the interface, too. The least we can do is try to minimize the damage.

   The letter-writer has a good point: Our system software error messages could be clearer, probably a lot clearer. We'll be working on that situation here at Apple; in the meantime, here are a few things for developers to keep in mind about their responsibility to move the error message interface in the right direction.

   Prevent errors. The most obvious way to make the situation better is to try to stop as many errors as possible from occurring. Software programs need to be thoroughly tested, and programmers need to eliminate any serious problems before shipping. Remember, one (system) bomb can ruin your entire day.

   But there's more to eliminating error conditions than just debugging your software. You should design your software so it's hard for users to make errors in the first place. For example, make sure that users can choose settings from lists of valid choices or by moving a control, instead of having to type in a number.

   For example, use something like the first Speaker Volume control:

Speaker Volume

Soft   Loud

Speaker Volume:
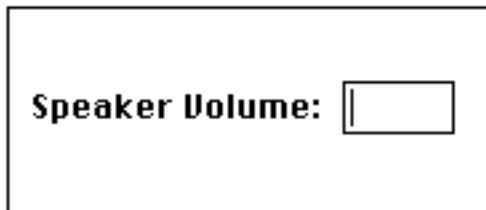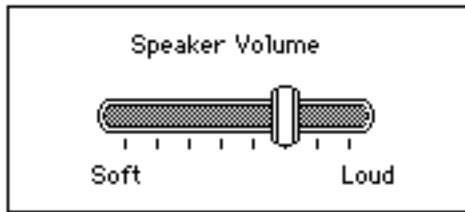
Instead of something like the second.

And, for a time when users don't enter something using exactly the right format, write your program to interpret what was entered before giving an error message. Never give an error message that says something like "State name must be capitalized"; have the software capitalize whatever was typed if it needs to be in that format. The guiding rule is this: It's always better to prevent error than it is to report it.

KNOW YOUR AUDIENCE

If your program does need to show an error message, be sure it's written for the person who will read it. I guarantee you, telling my mother that a segment loader error has occurred is going to do nothing except raise her blood pressure and her phone bill as she frantically calls her son in California for an explanation. On the other hand, that message makes perfect sense in a compiler program geared for professional developers.

It also makes sense for a low-level routine to pass cryptic, numerical error codes to the higher-level routines that call it. In this case, the "audience" for the error code is really another part of the program, and programs "read" these codes more efficiently than they would a long verbal message. This is where things like "error of type 15" come from. The problem arises when the part of the program responsible for interacting with the user merely passes on to that human user an error code meant for a machine.

WHAT DO
I DO NOW?

Too many error messages look like Figure 1, below.

Most users' first reaction to messages like this is "Oh, great! What do I do now?!" (Their second is generally "No, dagnabit, it's not OK!")

After you've told users what the problem is, it's important that you give them an idea of why the problem occurred, and what they can do about it. If your program isn't able to give a solid explanation of why the error occurred, at least try to suggest a general course of action for resolving the problem. A better error message might look like Figure 2, below.

BUILDING A BETTER ERROR MESSAGE

So, let's say you're a programmer who's spent the last 14 months of your life slaving over the Next Revolutionary Macintosh Application. Your eyes are bloodshot from too much caffeine, and you've sworn unholy revenge on the next person who changes the program spec. The last thing you probably want to do is to sort through every error message in your application to make sure that it's gracefully written in language ideally suited for the intended audience, and that each error message points out the problem, gives the reason, and offers a possible solution.

So make your project's writer or interface designer do most of the work for you (you do have an interface designer on the project, don't you?). It's actually preferable this way, since you're probably way too familiar with every message and the programming that leads up to it. Someone who isn't so experienced with the program code is going to find it much easier to see your error messages the way a user will, and word them accordingly.

To do the job, the person writing the error messages will need a list of every possible error message in the program. A good programmer will have this information available in separate resources anyway, so it's not too much of a trick to create the list.

Then, the development team should get together with the writer and go over each message, answering the following questions:

• What sort of user will read this message?

• What does this message mean? Is there a way I can say it that will be clearer to the reader?

• Will the average user have an idea what caused the problem? Can I provide some guesses?

• How does the user solve this problem?

I won't lie to you: This process is incredibly painful and tedious. It's also an essential way to improve your interface and drastically cut down your technical support costs. Most of all, it shows that you care about your users, and that even when things go wrong, you'll do your best to help them out.
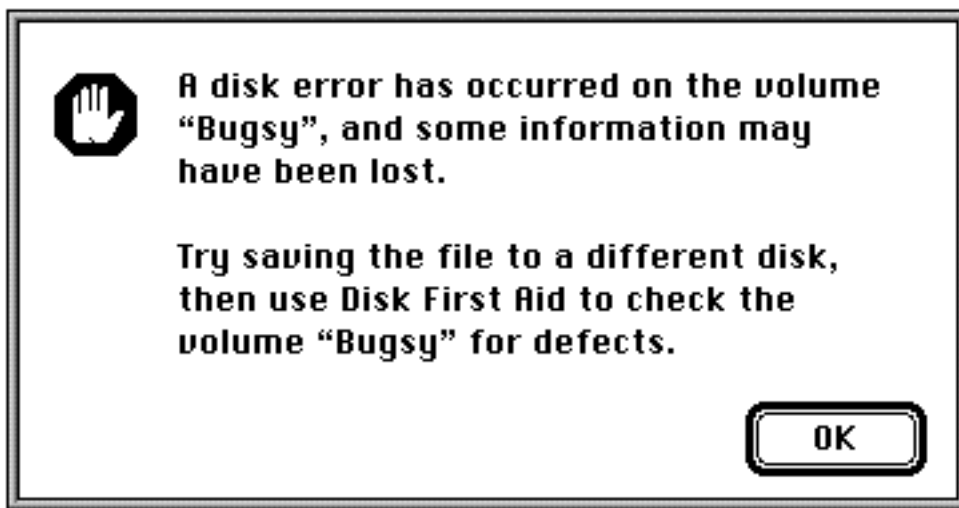
'Til next time,

—Doc

(AppleLink: THE.DOKTOR)
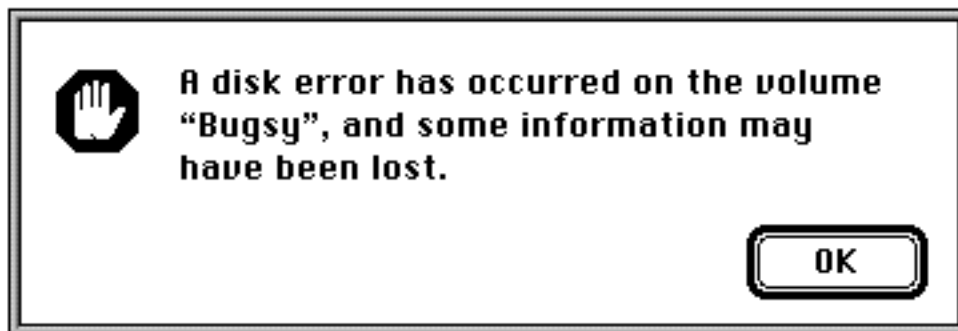
Figure 1: *A confusing error message.*

Figure 2: *An informative error message.*

European Distribution Channels

**Developer Options Emerge as the EC
Struggles to Life**

By David Smith, XPAND

David Smith, a former Apple Europe third-party channel manager and Apple world marketing manager, is the founder of XPAND, an international company that helps the Apple community bring products and solutions to international customers. AppleLink: XPAND.

Many people expect this year to be a watershed in the evolution toward a single European market. However, I'm convinced that, at least for the time being, the European Community (EC) is likely to remain a collection of individual, independent markets—and the most successful developers will be those who don't in the near-term try to conceptually group them together.

Developer opportunities in Europe—the Europe that is a collection of individual markets—have never been better; as "International Success Stories" in the August 1992 issue of *Apple Direct* pointed out, a host of U.S. developers, including small companies, are successfully competing in Europe. And if you think the U.S. market is large, take note that the EC as a whole in the long run will likewise be quite large.

Although a true EC single market is still years away, that's not to say there won't be near-term changes in Europe's computing industry. Apple's shift in 1991 to a high-volume, low-price strategy has already affected the third-party industry there (and almost everywhere else). Add that to the economic changes taking place in the EC, and you'll better understand the current personal computing environment in Europe. (For more information about the shifting economic situation there, see "A Sampling of EC Economic Changes" below).

Most notably, the distribution situation is undergoing a metamorphosis, and developers today have more distribution options to aid them in establishing European beachheads. To help you begin sorting out the options, I'll give you a snapshot of the current distribution situation in Europe, some differentiating information about each channel, and an outlook on the role each channel might play in the EC, based on XPAND's experience and studies of this market. Then,

I'll give you a way to put the options into perspective, based on your product's U.S. price point.

OVERALL TRENDS AFFECTING DISTRIBUTION

Several trends are affecting the distribution picture in Europe:

• *Increasing segmentation.* As different kinds of customers with new kinds of needs are attracted to the Macintosh computer, developers are faced with selling their wares to an increasingly diverse audience—not unlike what the automobile industry went through as it evolved. That industry has come a long way since Henry Ford said, "You can have any color you like, as long as it's black." Over the years, Ford accommodated diverse tastes and needs by segmenting its customer base; as a result, today Ford has an extensive product line catering to a wide range of drivers.

The Apple community is going through the same segmentation process. For example, Apple Europe has been split into four customer-oriented divisions: large accounts (and government), business (small- and medium-sized businesses), education, and consumer. Of course, within each segment there are a number of subsegments. Each division pursues its own channel strategy.

• *Software prices.* An important trend driving the U.S. industry today is the falling price of software. However, international channels can't yet effectively distribute products that sell at low price points in the U.S., without increasing their retail prices so much that high-volume sales are virtually impossible. (For details about why European prices are higher, see "Why U.S. Products Cost More in Europe" below.)

Our European customer research found that on the average, street prices of software in Europe are double the U.S. ones. One reason for high international pricing is that marketing costs in Europe are much higher than in the United States. For example, the average cost to reach a magazine reader through an advertisement in the U.K. is six times the U.S. cost.

• *Customer buying patterns.* In researching how Europeans buy personal computing products, we found that more than 95 percent of large corporate customers and more than 85 percent of small business and education customers want to try software before they buy it—and less than half of all customers found it possible to legally get demo packages.

Because of the lack of demo software, European customers use fewer applications than do their U.S. counterparts. The need to distribute demo software has been so strong that, after discussion with Apple, we created the *XPAND Electronic Expo* which delivers demo versions of software, QuickTime movies, and product information on CD-ROM to customers and industry insiders worldwide.

• *A distribution explosion.* In the late 1980s there was a distribution bottleneck in Europe, but in the last few years the distribution scene has exploded. Now a variety of channels exist, and developers are no longer forced to choose only traditional European channels—full-service dealer/distributors. The additional channel options include such things as VARs, multiplatform dealers, AppleCentres, retailers, computer superstores, national mail-order companies, pan-European mail-order companies, U.S. mail-order companies, national volume distributors, pan-European distributors, software-only stores, CD software distributors, and electronic software distributors.

However, it's not likely that all of these channels can remain intact as the EC struggles to life. The distribution situation has started to shake itself out, as distributors are forced to adapt to changes in the industry and the EC as a whole. Our studies and experiences indicate that channels such as large national mail-order companies, superstores, national volume distributors, electronic distribution, and CD-based distribution are likely to truly come into their own. Traditional dealers and full-service distributors—the more popular, well-entrenched channels of the past—will probably play a reduced role in the future.

To give you a better picture of the distribution players and their positions in the European market, here is an overview of each channel and a current prognosis for its role as the EC emerges.

FULL-SERVICE DISTRIBUTORS: VULNERABLE, HIGH-END FOCUSED

In Europe there is an overall trend away from full-service distribution and toward the U.S. national distribution model. In the U.S., developers use national distributors to "move boxes" and for dealer credit control, while developers handle marketing and technical support themselves. (For an overview of one U.S. national distributor, see "Understanding Distribution Realities" in the October 1992 issue of *Apple Direct.*)

Because most developers don't have marketing and technical support offices in overseas markets, they often engage a full-service distributor in each country, who supplies marketing, localization, and technical support services—and marks up the product to cover the cost of these activities. However, as the push toward lower-cost products and high-volume distribution grows stronger, full-service distributors may not remain as dominant a channel in Europe. There are some key reasons for this trend:

• *When volume increases, developers may choose alternative distribution options.* Full-service distributors are vulnerable in the evolving EC because, in effect, they are putting their own time and money into promoting and supporting someone else's product, hoping they'll reap the reward when sales increase. In reality, when volume increases dramatically, the developer often drops the full-service distributor in favor of a box-moving one that can increase the developer's margin. So, full-service houses find themselves constantly creating markets to the benefit of box-moving distributors who later supplant them and reap the rewards.

• *Full-service distribution is an expensive business.* Running an effective marketing, technical support, and localization business is expensive, and full-service distributors need reasonably high margins (around 30 percent) to support their infrastructure. This means that the products they carry reach customers at almost double the U.S. prices (after the dealer margin is taken consideration).

Our research has found that European customers learn of U.S. street prices through U.S. magazines, and they aren't happy about paying premiums in excess of 20 percent (never mind double the U.S. price!). Instead of buying through the full-service distribution channel they sometimes enter the gray market, importing the product directly from overseas.

As mentioned earlier, the falling price of software and hardware in the U.S.—and the resulting volume increase—hasn't been mirrored in international markets. Full service distributors often can't make a profit on products that have been successful in the United States because it's simply too expensive to create the necessary demand.

• *It's expensive and resource consuming to create demand.* Assuming that developers can get their products stocked by a "box moving" distributor in Europe, to be successful developers must, as in the United States, take responsibility for creating international demand. A number of marketing and

technical support agencies—surrogate international offices for developers—have sprung up in response to this need for local marketing and technical support. However, working with these agencies requires a great deal of a developer's time and resources. No matter how you approach it, you still must create demand whether you do it yourself or have someone do it for you.

All of these circumstances are changing the role of full-service distributors in Europe. In many cases, the role of this distributor is declining, especially for products and companies that are established in the market. These distributors are being forced to move up-market and to serve customers who are prepared to pay for added-value services. Many full-service houses are therefore focusing on areas such as high-end publishing and networking and communications products, which they can sell at high prices and achieve high margins.

Therefore, full-service distributors can continue to serve companies, including smaller ones, with high-end products that are entering the European market for the first time. They can also serve developers whose resources are so limited that this distribution arrangement is the only feasible way to penetrate the market. Full-service distributors can help these developers establish a presence in Europe; however, in the long run developers who have been successful may need more breadth to handle increased demand, and may move on to broader distribution arrangements.

DEALER/DISTRIBUTORS: GOOD IN SMALL OR VERTICAL MARKETS

To explain what appears to be happening to dealer/distributors in Europe, I'll use a parable: Apple opens a subsidiary on Mars in 1993, and the first order of business is to recruit a dealer channel. These dealers need to sell localized versions of third-party hardware and software, which is difficult when there is no established distribution infrastructure.

So the Martian dealers climb into space ships and fly to Macworld San Francisco or Boston where they meet developers and offer to distribute their products on Mars. The developers see this as an incremental business opportunity and perceive no problem in giving the Martian distributors exclusive distribution agreements.

The dealers return to Mars with several agreements in hand and begin importing products, which they sell either to other Martian dealers or directly to

their own customers. Over time the businesses grow and mature, and some of these "dealer/distributors" decide to focus exclusively on distribution and not compete with their dealer customers.

The dedicated distributors approach U.S. developers, offering them a less constrained distribution channel than the existing dealer can. As the Martian market matures, the developers begin taking their products away from dealers and giving them to the dedicated distributors.

The moral of the story is that the generalist dealer/distributor is viable in a small or immature market where the economies of scale don't favor the larger specialist: The larger the market the fewer the products being distributed by dealers. As the EC takes shape, this scenario is quite probable. Currently there are relatively few dealer/distributors in larger European markets (such as the U.K. and France), but in smaller markets such as Denmark and Norway, they thrive.

In my opinion, dealer/distributors will survive because they'll find niches in vertical market segments. Complex, high-price, low-volume products are best distributed by these dealer/distributors, who can offer a complete computing solution to vertical market customers who need hardware, software, customization, training, and technical support. If your high-end product is destined for a vertical market in Europe, this distribution arrangement is an option for you, as may be VARs (see below).

VARs: Going Vertical

In the face of proliferating retail channels (such as computer superstores), Value Added Resellers (VARs) are finding it increasingly difficult to maintain margins on hardware and software. To survive, they therefore must reduce the number of products they carry and begin offering such things as integration or software customization services. Because their business models usually are based on margins in excess of 40 percent, VARs are moving into highly complex vertical markets, such as engineering and architecture, where hardware revenue is negligible and software is the real money maker.

National Volume Distributors: Well-Situated for the 90s

Most products are currently shipped to European customers through national volume distributors; they act as the local arm of companies such as Ingram or Merisel, moving boxes and handling dealer credit control. In all fairness, they

offer more services to developers than do many of their U.S. counterparts: For their 12 to 20 percent margins, national distributors not only move boxes and handle dealer credit, but they also manage trade show activities, create co-op advertising campaigns, and provide limited technical support.

Their businesses have grown significantly during recent years, and they have learned how to cope with increasingly intense competition. Overall, they have responded well by becoming more efficient, and have been rewarded by growth and profits. I think national volume distributors are well situated to continue growing in the EC of the 1990s if they continue to improve their inventory and distribution systems.

PAN-EUROPEAN VOLUME DISTRIBUTORS: BEFORE THEIR TIME?

The concept of the large, pan-European distributor will work best only when Europe is truly united economically and thereby offers this kind of distributor an economy of scale. The concept of a single European warehouse supplying various markets is currently not very feasible due to problems inherent in shipping products across borders, multiple languages, and other logistical considerations.

Ingram, Merisel, and Computer 2000 (a German company) are currently the major players.

Because the EC today is not conducive to true pan-European distribution, these giants are establishing themselves independently in each (currently) separate European market by buying local volume distributors. They use their U.S. predominance to convince developers to sign global distribution agreements. This enables these distributors to compete in multiple markets and forces local distributors into a bind, since they know they can't compete with the larger distributors' lower prices.

When we have achieved a united European market, pan-European distributors will surely be significant players; but until that time, I can't see them having a significant influence on distribution to individual, local markets.

Multiplatform Dealers: Suited to Large Accounts

To survive, many dealers who were previously tied to a single platform have begun to carry products from multiple platforms. Macintosh and Microsoft Windows are obvious choices, but the workstation market can also be profitable. The concept of one-stop shopping, which multiplatform dealers offer,

appeals to the purchasing departments of large corporations, who usually own hardware from a variety of manufacturers. This is where the future lies for multiplatform dealers. (They currently number about 20,000 in Europe.)

RETAILERS: PROBABLY NOT BEST FOR THIRD-PARTY PRODUCTS

European retail is very similar to its U.S. counterpart; it basically offers developers floor space and order-taking facilities. Retailers' purchasing departments prefer one-stop shopping, and usually deal with only a handful of the aforementioned national volume distributors. (Don't bother trying to get retailers to consider your product if it isn't sold through their established supply channels.) They are powerful and usually demand products on consignment, sale or return terms, and/or extended credit terms (often 90 days).

Because the revenue from Apple Europe's consumer business unit is defined as all income earned through the retail channel, Apple Europe has been recruiting and educating retailers at a fast pace. For Apple, the most successful retail model in Europe is FNAC in France, which probably has the most unlikely range of products. In addition to the usual cameras, stereos, TVs, and other consumer electronics items, they sell theater tickets and hold art exhibitions and presentations.

The computer department offers a full range of Windows and DOS machines alongside the newly arrived Macintosh Performa models. They sell music CDs as well as a range of non-Macintosh software and a small proportion of Macintosh packages. Apple is also testing a number of retail channels in the U.K.

I predict that these European retail channels will become the primary distribution mechanism for low-end Macintosh computers, but won't be a significant channel for software and third-party hardware, other than products bundled with CPUs. This seems to match the mood of the market: Our research found that customers expect to buy CPU hardware and software from different retail outlets (except computer superstores, covered later in this article), just as they wouldn't dream of buying their music CDs from the same store where they bought their stereo systems.

COMPUTER SUPERSTORES:
ON THE RISE

When we asked small business owners about their ideal channel for purchasing personal computing products, they chose the computer superstore. They perceive that it offers a wide range of products at reasonably low prices and, most importantly, customers can see products before buying them (something not possible with a major competing channel—mail-order).

On the other hand, large corporations have complex purchasing processes that prevent their buyers from purchasing from superstores or other retail channels. They therefore prefer to buy from dealers who offer credit arrangements.

Computer superstores are flourishing in many parts of Europe, and new ones seem to pop up almost weekly. Their growth has been fueled by preferential pricing and extended credit facilities from the major personal computing manufacturers, who expect superstores to outsell established dealers and become their major channel in coming years.

In Europe, these stores are small and pedestrian in comparison with some U.S. superstores, and they carry only a fraction
of the stock. They usually operate only one or two cash registers, compared to the five to ten (and up to 30 at peak times)
at some American superstores.

Who's opening these superstores? Established retailers, dealers, mail-order companies, distributors? All of them, it seems, but mostly dealers and mail-order companies who have rented a large space, hired retail sales people, and run aggressive local advertising campaigns. Tandy has established electronic superstores in Scandinavia, and it is likely to have aggressive growth plans for the rest of Europe, where it already owns chains of small retail stores.

Also, some large department stores are teaming up with computer superstores. My opinion is that experienced retailers will eventually take over this quickly emerging channel.

The European computer superstore could become very significant for Apple developers if they can get their products onto the shelves. However, it will be difficult to do so in the near future; developers must begin to offer low-cost products with high retail margins on a sale or return basis—something the distribution infrastructure in Europe can't handle right now.

SOFTWARE-ONLY STORES: NOT AS VIABLE AS IN THE U.S.

Although Egghead and other software-only stores have been successful in the U.S., there has never been a large, successful chain of software-only stores in Europe. In large cities, small independent software stores have tried to create a niche for themselves by selling games and low-cost business software, with very little success: The cost of inventory and need to regularly write off vast quantities of obsolete stock make this business very risky.

Although the software market is growing on all platforms (Nintendo and Sega games are phenomenally successful), the growing superstores and mail-order channels will probably continue to prevent software-only stores from becoming successful in Europe.

NATIONAL MAIL- ORDER: SIGNIFICANT GROWTH AHEAD

Most personal computer software in the United States is sold through mail-order. However, this isn't the case in Europe where, until recently, mail-order has been quite insignificant. There are at least three reasons for this difference: Most European PC mail-order suppliers have gone out of business while owing customers refunds, which has hurt the suppliers' credibility; mail-order in general has a very poor image in most parts of Europe; and Europeans don't benefit from the same "out-of-state" sales tax exemptions as do some customers in the United States.

In our research I was surprised to find that many European customers would never consider buying computer products from a European mail-order company, but they were happy to buy from large U.S. ones. After further research we found that these customers didn't trust their local suppliers and would not give them credit card details without some assurance that the suppliers were financially sound and credible.

Credibility is now improving as the large U.S. mail-order companies set up European subsidiaries. MacWarehouse has quickly established strong subsidiaries in the U.K., Germany, and France, and is being followed by many of its domestic competitors. However, European customers are still a little disappointed that pricing is so much higher than in the U.S.; most prices are marked up 50 to 100 percent.

I believe that in the next few years, growth in the mail-order business in Europe will be the most significant distribution trend for developers selling products mainly to small business users who, unlike most large corporate users, can place orders with credit cards. Companies like MacWarehouse can

distribute low cost software in the major European markets with a fraction of the energy involved in setting up a more traditional local distribution arrangement.

PAN-EUROPEAN MAIL ORDER: PROBABLY NOT YET

It is almost as time consuming and expensive to ship boxes from one European country to another, as it is to ship them to Europe from the United States. So until we find ourselves in a truly united Europe, a single European mail-order facility supplying a number of countries will probably find it difficult to succeed.

However, because the European telephone infrastructure can now handle pan-European toll-free numbers, it is possible to operate a single order-processing center to serve customers throughout Europe; for example, operators fluent in a variety of languages could staff the telephone lines. If a developer were to try to recreate its U.S. mail-order (direct sales) operation in Europe, it could be done from a single country, and customers would be under the impression that they were talking to a local office. However, pan-European mail-order will not be widely feasible for many years.

CD SOFTWARE DISTRIBUTION: HOT COMPETITION FOR U.S. MAIL-ORDER

A single CD-ROM can be loaded with many software packages and delivered to dealers, distributors, and customers at a relatively low cost, making this distribution method quite attractive. (Of course, the software has to be protected from piracy.)

We conducted research in 1991 that revealed that European customers gave a high rating to CD-ROM as a channel through which they would buy low-cost software (less than $100). This is important, given that European software buyers want to be able to try software packages before they buy them.

On the other hand, developers were worried about potential piracy and channel conflict problems, and they didn't seem interested in exploring any form of electronic distribution that departed from the traditional shrink-wrapped disk with
manual.

To date, CD-based distribution has not been used extensively in the U.S. market because its competition, mail-order, is an efficient channel for low-cost, low-margin products. However, CD-based distribution clearly is an attractive international channel becuase it is the only way to offer U.S. pricing to overseas

customers. (To better understand why this channel offers almost unbeatable prices in overseas markets, see columns 8 and 9 in "Why U.S. Products Cost More in Europe" below.)

Windmill and Instant Access are the leading CD-based mail-order distributors in the international Macintosh market, and they work with developers of all kinds and sizes. They have encryption (locking) algorithms and offer their own local unlocking centers in European and Pacific markets. Other large developers are pressing their own CDs and establishing their own unlocking procedures.

The financial model for CD distribution is unbeatable today. Without shipping or warehousing costs, this channel offers European customers prices that compete with U.S. mail-order. Some developers continue to resist CD distribution, but it will probably succeed, given the forecasted explosion of CD-ROM use (and Macintosh computers with built-in CD-ROM drives), and will eventually become as significant an international channel as mail-order.

ELECTRONIC SOFTWARE DISTRIBUTION

Several years ago the French government established a national on-line service called Minitel, and ensured that it would succeed by giving away terminals. Terminals are now installed in almost all French homes and businesses.

Commercial software is distributed through this on-line service, and France Telecom collects the money and pays the distributor.

However, the process is painfully slow, for two reasons: The transfer rate of Minitel is 75 bits per second (bps) in one direction and 300 bps in the other; and because France Telecom charges by the minute instead of by the application, Minitel slows down the transmission speed of an application so that the download time
corresponds to the product's price. In other words, it could take 12 hours to download a word processor or spreadsheet package.

But people do use Minitel to buy software, and it will become increasingly popular as transmission speed increases. (High-speed ISDN lines are widely available in France.) Europeans can also use AppleLink and other on-line services to download and place orders for software, and this trend will increase as international telecommunications bandwidths broaden. Satellite TV has become very popular in Europe, and that technology can also be used in the future to deliver software at a fast rate.

DOING YOUR HOMEWORK

After spending many years marriage-brokering developers with distributors, I have found that choosing a channel is a very personal and individual process; what works for one developer will probably fail for the next. However, for some ideas about how to begin sorting through the options, see the figure and its explanation in "Making Sense of the Options" below.

   Obviously, to be successful in international markets you must make the effort to understand the strengths and weaknesses of various channel options—either yourself or by hiring experienced international sales and marketing representatives to assist you. While the proliferation of channels appears, on first inspection, to be something of a maze, it isn't insurmountable. The time and effort you invest in doing a little bit of homework will pay off handsomely: It will increase your chances for taking advantage of the huge market potential available in Europe now—and in the EC of the future. ◆

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Why U.S. Products Cost More in Europe

The table below is a financial model of the margin and pricing structures for the various European distribution channels. This information (except for CD and electronic distribution, of course) applies to hardware and software. The model is based on an imaginary product with a suggested U.S. retail price of $100.
   Looking at the "cost to customer" row, you can see that a U.S. customer buying the product through mail-order in the United States will pay $55, while an international customer could pay $102 if buying the product through the traditional full-service distributor/dealer channel. This is an increase of 84 percent, which is representative within the industry, as found in our European customer research.
   European customers are not happy about paying more than a 20 percent increase (uplift) over U.S. street prices, which is a sitauation conducive to gray marketing (and piracy). The only channel in this model capable of delivering products in Europe with less than the 20 percent increase are CD-based distributors, who benefit from negligible shipping and inventory costs other

than manuals. (Note: for simplicity we have assumed that local sales taxes are the same in all markets. All numbers are rounded.)

Column 1: U.S.dealer/distributor channel to U.S. customer. This column shows how a product flows from the developer through the U.S. distributor and dealer to the U.S. customer. The distributor's buying cost is $43 and it sells the product to the dealer for $49 after adding its 12 percent margin (this margin is often much lower for high-volume products). So, walking into a U.S. dealership, a customer can expect to pay about $70 for this product.

Column 2: U.S. mail-order to U.S. customer. U.S. mail-order companies often purchase stock from U.S. distributors and, as with dealers, can expect to pay $49 (assuming they don't get volume discounts). However, mail-order companies sell the product for $55 because they don't have the overhead associated with running a dealership operation. This is the lowest price a U.S. customer can expect to pay for the product and the major reason why mail-order is the most significant channel in the United States.

Column 3: Sole full-service distributor and dealer to international customer. In international markets, the traditional first step for developers is to appoint a single full-service distributor to undertake the localization, marketing, and technical support activities that developers themselves carry out in their domestic market. Our research found that more than half of international distributors paid higher prices than their U.S. counterparts receiving a smaller discount of 55 percent, which is counter-balanced by a cooperative marketing fund offered by that developer (say 3 percent). Of course, shipping and currency costs are significantly higher overseas, and their "landed cost" could be $46.

  In exchange for this high degree of added value, these distributors demand a margin of approximately 30 percent. (Many developers are surprised that the margin is often much higher then they expect). Add that to the dealer margin of 35 percent, and the product hits the street at $102.

Column 4: Multiple full-service distributor to international customer.
Often, developers appoint two or more full-service distributors. In such a case, because no distributors have an exclusive contract, none are likely to offer

significant marketing or other services because the orders they create could be filled by a competitor who offers a lower cost. So in this scenario it is normal to assume that distributors list the product in their catalogs but don't otherwise promote it.

This means that they don't receive any cooperative marketing funds from the developer and they work on slimmer margins of 18 percent. They sell to a dealer at $60 and the product thus retails at $93.

Column 5: Volume distributor to international customer. If a developer has a local office creating demand for a product, it may eventually ship in high volumes and become a target for a U.S.-style national volume distributor; the distributor has finely-tuned box-moving operations capable of making a profit on 12 percent gross margins. It sells the product to the dealer for $56, and the customer pays $87.

Column 6: U.S. mail-order to international customer. Considering the street price in Europe through the previously-mentioned channels ($87 to $102), it's not surprising that many international customers prefer to purchase a U.S. computer trade magazine and use a credit card to order a product directly from a U.S. mail-order company. The shipping and duty costs are higher than they are for U.S. customers, and the international buyer pays approximately $65.

Column 7: International mail-order to international customer. For high volume products, local (European) mail-order companies will buy a product from a national volume distributor for $56. The local mail-order company is not importing the product, so its shipping costs are low (5 percent) and it sells the product to the customer at $72, a 30 percent uplift over the mail-order cost to U.S. customers.

Column 8: CD-based distributor to international customer. Shipping and currency costs are low because CD-based distributors don't carry inventory other than manuals. The manuals are mailed to customers after they have paid by credit card to have the software unlocked from the CD and downloaded onto their hard disks. Through this channel European customers can pay almost the same price as their U.S. counterparts: $56.

Column 9: CD-based distributor to international customer with dealer kickback. CD-based distributors may offer dealers an incentive—usually a 15 percent kickback—to introduce customers to this new channel. This increases the customer price to $66—still below the 20 percent uplift level that leads to gray marketing and piracy. ◆

Column	1	2	3	4	5	6	7	8
U.S. Retail Price	$100							

	U.S. Market		**International Market**					
			Sole	Multiple			Int'l.	C
	Distributor	U.S.	Full-Serv.	Full-Serv.	Volume	U.S.		
Mail	Mail	CD	Dist. w/ Dealer					
	Cost	Mail Order	Dist.	Dist.	Dist	Order	Order	Dist. Kick
Dist. discount	58%		55%	55%	55%			55% 5!
Co-op marketing funds	0%		3%	0%	0%			
Dist cost before shipping		$42		$42	$45	$45	$49	$56 $
Shipping & currency	2%		10%	10%	10%	10%	5%	2% 2
Shipping cost	$1		$4	$5	$5	$5	$3	$1 !
Dist. buying cost	$43		$46	$50	$50	$54	$59	$46 $
Dist. gross margin	12%		30%	18%	12%	18%	18%	18% 1!
Cost to dealer	$49	$49	$66	$60	$56			$
Dealer gross margin	30%	12%	35%	35%	35%			1!
Cost to customer	$70	$55	$102	$93	$87	$65	$72	$56 $
Uplift over U.S. mail order		26%	0%	84%	68%	56%	18%	30% 1
Gray marketing likely			Yes	Yes	Yes		Yes	

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A Sampling of EC Economic Changes

While it will be some time before the economies of Europe are melded into a seamless, single entity, many changes are taking place that are already having an impact on distribution in Europe. To understand this impact, it's important to put it into the context of the challenges the European Community (EC) is facing as it struggles to life. Here are some important examples:

• *The EC has suffered a setback in its attempts to create a single European currency.* The European Exchange Rate Mechanism (ERM) attempted to encourage international trade by "fixing" the price of European currencies against each other, but allowing them to float against the U.S. dollar. This attempt has been less than successful because it forces most countries to maintain artificially high interest rates to keep pace with the German Deutschemark.

These high interest rates have been a major cause of a massive recession in some European countries. As a result the British pound sterling, Italian lira, and other currencies now float freely against each other and the U.S. dollar. With the ERM's failure, many people feel that having a single European currency is now delayed beyond the next decade.

• *Cross-border shipments will be taxed.* Cross-border shipping in Europe is not easy. (It is significant that in 1992 Federal Express pulled out of the intra-European market after years of heavy losses.) In theory, all border controls will be relaxed in 1993, but in practice this will probably not have a major impact on European trade for many years.

In addition, European governments are frantically trying to establish a single value added tax (VAT) on all cross-border shipments. For the next few months there is likely to be a large degree of confusion as the new system is put in place and businesses try to claim their international VAT refunds.

• *To help protect local markets from overseas competition, the EC is attempting to standardize goods.* The EC was established in great part to spur free trade and thus increase prosperity and industrial growth in Europe. The Global Action on Tariffs and Trade (GATT) talks are an attempt to establish a single global trading market; unfortunately, they are currently floundering because the Europeans (especially the French) want to protect their markets from overseas competition.

This presents an interesting dilemma: reconciling the 1993 move toward a single market with the resistance to free trade. Instead of trying to resolve this dilemma, EC officials are trying to standardize European products—for

example, the amount of fat in minced beef and the amount of milk in milk chocolate. The computer industry is not likely to be immune to this process. ◆

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Making Sense of the Options

Choosing the right channel for your product is a process that varies from developer to developer. Unfortunately, there's no simple "how-to" or formula that applies to everyone. However, you can make some generalizations about what your appropropriate channels may be, based on the U.S. price point of your product.

  The chart here shows the relative relationships between key factors that you should consider: the retail price of a product, channel margin and added value, channels through which a product flows, customer willingness to pay a premium for value-added services, and the potential unit market size for a product.

  Here's an example to help you interpret the chart, reading downward: If your product's U.S. retail price is $100, then the channel margin for the product in the United States and Europe is low and the channel would not be likely to provide many services to you or your customers. The most effective channels for this product would probably be those that are least expensive, such as mail-order, CD distribution, or electronic distribution. At this price point, the customer is usually not willing to pay a premium for added-value services; however, at such a low price the potential market size is probably large.
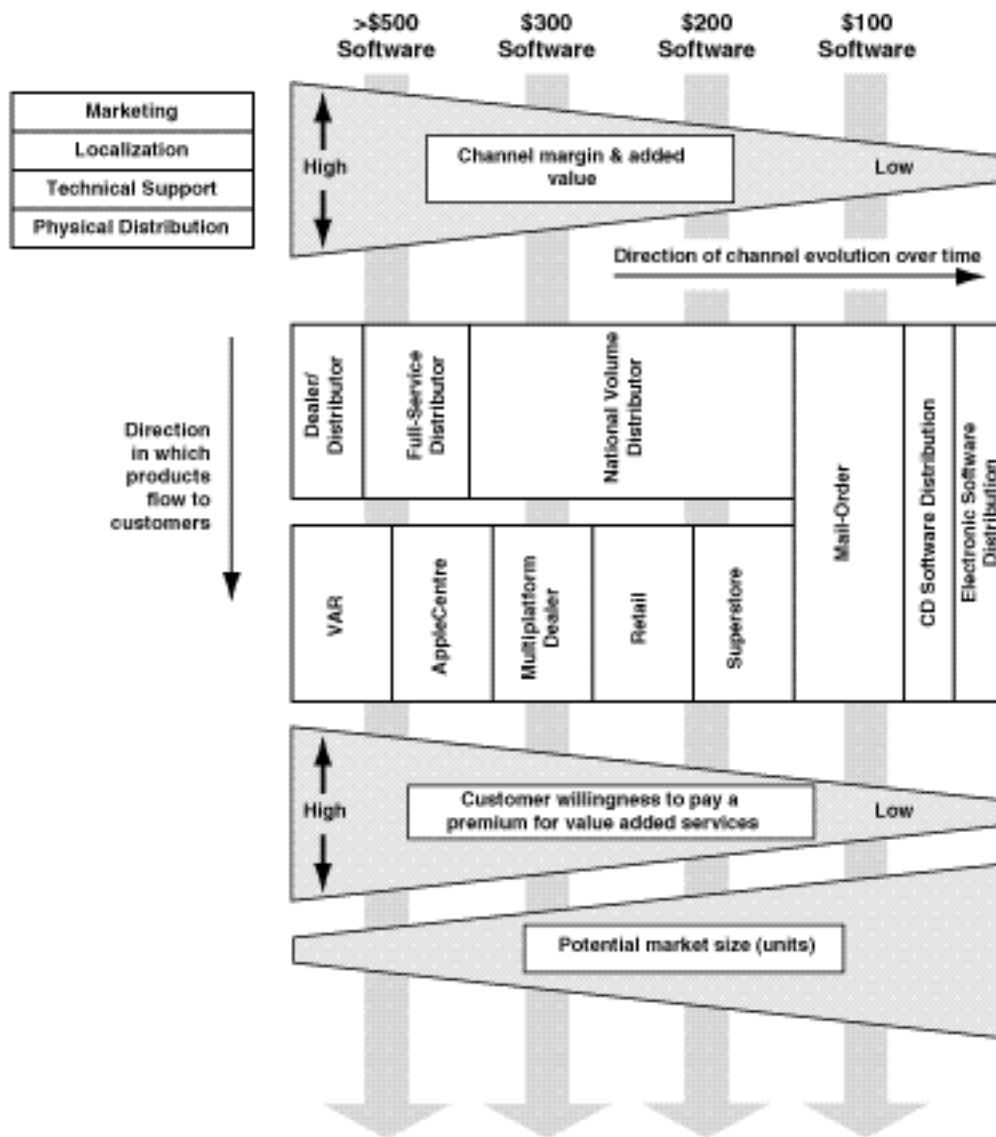
However, there will be exceptions to this scenario for individual situations. For example, if you aren't established in Europe, you may wish to engage a full-service distributor who offers you a higher marketing support level to help you create a presence there. The cost to you, of course, will be higher, but the long-term benefits of getting a foothold in Europe may be well worth it.

Here's another example: If your product's U.S. retail price is $300, your channel's margin will be higher and chances are that you may need some degree of channel services to help you sell this higher-priced product (which will cost buyers more in Europe). You could use a European national distributor, who may then sell your product to a multiplatform dealer, retailer, or computer superstore—depending on the nature of your product and the

possible margins for the national distributor. At this price point, depending on the complexity of the product, customers may be willing to pay for some degree of services. Your market size will probably be smaller than that for a less-expensive product. ◆

GetNextEvent

The "**" indicates the trade shows/events at which Apple Computer, Inc. is scheduled to exhibit as of press time. This list may be incomplete. If you have information about a show that you want listed here, contact Developer Technical Communications, 20525 Mariani Avenue, M/S 75-3B, Cupertino, CA 95014. For further information check the Events folder on AppleLink (path—3rd Party Connection:Events).

February 26 through March 4
Graphispag
Barcelona, Spain
Contact: Yolanda De Juan
(34) 1 5974750
AppleLink: SPA.EVENTS

March 27 through 29
** ASCD
Washington DC
Contact: Glenn Fisher
AppleLink: GFISHER
(408) 974-8505
ASCD (703) 549-9110

March 30 through April 1
** Intermedia
San Jose, CA
Contact: Dave Billmaier
AppleLink: BILLMAIER1
(408) 974-6553
March 31 through April 3
** NCTM
National Council of Teachers of Mathermatics
Seattle, WA
Contact: Lori Deuchar-Yum

AppleLink: DEUCHAR

(408) 974-8626

NCTM (703) 620-9840

April 1 through 4

** **NSTA**

National Science Teachers Association

Kansas City, MO

Contact: Kenyon Scott

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