

## **New Product Overview**

In the fall of this year the Newton Systems Group, part of the Information Appliance Division of Apple Computer, Inc., will announce two new products based on the Newton OS. The new products, which will begin shipping in the first half of 1997, are the MessagePad 2000 and the eMate 300. This article provides an introduction to the hardware, OS enhancements, and new applications that are part of these products.

### **MessagePad 2000**

The MessagePad 2000 is a cost-effective, powerful, easy-to-use handheld computer that can provide targeted solutions in both the horizontal and vertical markets.

Based on the latest StrongARM RISC processor, the new device runs the Newton OS up to ten times faster than previous devices. It further adds to the power of Newton OS 2.0 by providing sound in to the existing sound out capability, a grayscale display, IrDA interface support, auto docking, and improved support for text editing. There are also two PC Card slots, enabling solutions that require both a memory card and a communications card.

The power and features of MessagePad 2000 will appeal to new types of customers in addition to existing fans of Newton products. It will also allow developers to create whole new classes of solutions. Between the Apple product bundles and these new solutions, we can take the Newton platform to the next stage of growth.

### **eMate 300**

The eMate 300 is a rugged, low-cost computer with a large grayscale screen and embedded keyboard and is intended for use in the education market.

The education market is a new one for the Newton OS. The US education system alone consists of one hundred thousand schools with 48 million students, 2.8 million teachers, and nearly a million administrators. The US government in Goals 2000 has set a student to computer ratio for the classroom of three to one. To achieve this, nearly 12 million computers will need to be purchased for schools in the next four years.

At less than half the price of a low end desktop or one third the price of a laptop, the eMate 300 makes these goals more achievable because it offers nearly all the productivity of a traditional computer. Long battery life, durable and lightweight hardware, and

connectivity to traditional computers set the expectation that the eMate 300 will be extremely popular with students, teachers, and administrators.

## **Common Features**

The MessagePad 2000 and the eMate 300 are both built around the same basic hardware design and OS. Here are the features common to both products.

### **Based on Newton OS 2.0**

The new operating system is an extension of the 2.0 release of the Newton OS. Applications written for existing Newton products will work on both the eMate 300 and MessagePad 2000 devices. Data can be freely exchanged between the new devices and existing products.

Selected enhancements have been added to the OS to improve support for the new hardware. Support for the keyboard, larger grayscale display, and additional communications hardware is fully integrated. A basic view class tuned specifically for word processing has been added, and a new set of applications and a framework are also provided.

### **New Silicon**

In order to make it easier for Apple and its licensees to create devices based on Newton technology, Cirrus Logic, Inc. and Apple Computer, Corp. worked together to produce a core Newton Technology chipset. The result is the Apple Newton PDA Chipset. There are four basic chips in the set: a Digital System Controller (DSC), an Analog System Controller (ASC), an IR Controller (IRC) and a PC Card Controller. Any Newton device will add ROM, RAM and I/O (ports, screen, speaker, PCMCIA, etc.).

The eMate 300 and The MessagePad 2000 are the first Newton devices to be introduced using this new chipset. Although the units differ radically from each other in physical appearance, thanks to the chipset their schematics are nearly identical.

### **Grayscale**

Both eMate 300 and the MessagePad 2000 feature half-VGA sized four-bit grayscale displays that will show sixteen shades of gray. The Newton OS has been extended to support both grayscale and color while still maintaining full backward compatibility. All existing calls now support both monochrome and color objects, and APIs have been added to access the new gray/color features.

Color values are specified using an RGB triplet where the values are either five or eight bits, for 16 or 24-bit color. Color can be used for patterns, drawing and text. The system can display color PICTs and bitmaps that have one, two, four or eight bit depth, and there is support for antialiasing monochrome bitmaps.

Newton Toolkit and Newton Press will be updated to seamlessly support grayscale and color images as well as the larger screen sizes.

### **Keyboard**

Extensive enhancements have been made to improve support for keyboards. Menus and buttons allow key equivalents and keyboard navigation, and standard key combinations are handled by the system.

Event handlers can be added for command keys, or for any key combination, and like other NewtonScript structures, the key definitions can use inheritance chains to reduce memory requirements. Menus and command keys can use the same definition frames to further simplify design and coding.

In the new OS, any view may accept keyboard input, and views are now notified when they gain and lose keyboard focus. All views also get a chance to preprocess any key input, for fully customizable interfaces.

### **Sound**

The updated Newton OS features enhanced sound output and has added sound input. Most of the new functionality is provided to developers by a new proto, `protoSoundChannel`, which makes it possible to: specify a direction (input or output); queue up sounds for playback or recording; and pause or stop recording or playing. It is also possible to specify the channel for the sound: line-in, or the MessagePad 2000's embedded microphone; or speaker, line-out, or the eMate 300's headphone jack. Another new proto is (`protoSoundFrame`) can be used to access sound data, such as finding the playing time of a sound, and there are new user interface elements for recording sounds.

There is support for playback of up to four simultaneous sounds. The OS will also support recording or playing 8-bit (Mac standard) or 16-bit linear encoded (CD quality) sounds.

### **IrDA**

Existing Newton devices use the Sharp ASK IR communications protocol. The new devices use the Infrared Data Association's (IrDA)

standard for infrared communication. This is a cross-platform standard supported on both Windows-based and MacOS computers, as well as other devices such as IR printers. The new devices also support ASK for backward compatibility.

The IrDA implementation in the Newton OS includes the link access protocol specification (IrLAP), the link management multiplexer protocol specification (IrLMP), and the hardware serial infrared interface specification (SIR). SIR includes communications rates up to 115 kbps, and also supports both primary and secondary roles (that is, the Newton device can be either a client or a server).

IrDA is fully integrated into the Newton endpoint communication paradigm. Existing code can be easily modified to take advantage of IrDA. Unlike the ASK protocol, IrDA simulates a full duplex connection.

### **Text Engine**

A new view class has been added to greatly improve performance with large blocks of text. Text is displayed in a paged, WYSIWYG manner that can scroll very quickly. Text blocks up to the limit of available user storage can be viewed and edited with no delays.

The text is fully styled, including multiple font faces and sizes in various styles. Pictures of any size, in the form of Newton shapes, can also be embedded in text.

Rulers allow formatting on a paragraph-by-paragraph basis. Margins, line spacing, indenting, and justifications are all supported, as are left, right, center, and decimal tabs.

Interfaces provide developers with the ability to read and manipulate any text attributes. It's also easy to convert between text positions and screen locations useful for determining when a word has been tapped. Editing commands such as cut, copy, paste, and clear are built in, and there are calls for search and replace that work whether the text is displayed on screen or stored in a soup.

The text engine is virtually a complete word processor, and can be used as a base class for other applications such as HTML viewers, hypertext browsers, email editors, reference engines, and so on.

### **Spell Checker**

Using the built-in dictionaries, the new OS now features the ability to check spellings and offer alternatives for misspelled words. APIs allow developers to integrate spell checking with their own applications.

## **NewtonWorks**

A new extensible application framework has been added to facilitate classroom use. Designed for the eMate 300 but also available on the MessagePad 2000 platform, the framework, dubbed "NewtonWorks" or simply "Works," is a shell for basic productivity applications such as word processing, drawing, math and graphing, and spreadsheets.

Works uses a document metaphor. Each paper, drawing, graph, spreadsheet, or whatever appears as a single self-contained document. Works provides the framework for viewing and editing each document, and for switching between documents.

Developers can add new types of documents to the Works shell by registering stationery, much like extending the Notes application on existing Newton devices. Works-specific features have been added on top of the stationery APIs to allow for application specific help and preferences, custom data in title slips, Works-wide searches, and custom tools. Only a single viewer/editor needs to be provided, and multiple print or routing formats may also be added.

Like the Notes application, Works applications must be designed to store document data in a single soup entry. The Works framework manages the data storage so that applications developers don't need to worry about soup design. The Works framework also provides both horizontal and vertical scrolling, title bars, and a status bar that can be extended with custom buttons and menus.

The Works framework also allows applications to customize each other, by providing a registry for tools. The built in Works applications all support various forms of third party extensions using this tools registry, and some allow additional extensions.

### **Word Processor**

A standard word processor application is provided within the Works framework. In addition to providing a ruler, button and menu user interface to the Text Engine, the word processor features a spell checker and quick sketch editor.

A spell checker and quick sketch tool are integrated with the word processor as standard Works tools, and other tools can be added using the same facility.

### **Drawing**

Also provided within the Works framework is a draw-style graphics application. The application provides the usual range of shape creation tools in a tool bar: lines, squares and rectangles, circles and ovals, curves, and polygons, along with a shape recognizer tool. Each

shape may be drawn with a variety of line styles or fill patterns, using the grayscale capabilities of the devices.

Adding to these standard tools, the drawing stationery also provides a set of pictures that can be "stamped" onto a drawing. The set of stamps, and the available fill patterns can easily be extended through draw application interfaces.

The Drawing editor supports the standard Works feature of an extensible Tools menu, and APIs are also provided to allow developers to extend the tool bar with custom drawing tools, and provide custom editing of the shapes created.

Because the contents of a drawing are based on standard NewtonScript shapes, drawings can be easily integrated with other applications. Cutting and pasting between a drawing and a word processor document is a simple operation.

### **Calculations**

Another Works drop-in is stationery that provides graphing calculator features. Users can enter and evaluate variables and equations using standard mathematical notation, and display the resulting functions in a graph or a table view. Polar and parametric graphs are supported, and the interface makes it easy to zoom in to look at details or zoom out to get a big picture.

Teachers or other experts can easily create and distribute pages of predefined equations or constants, or templates for homework. Developers can further extend the set of built-in functions and constants to provide custom functions for specialized financial, statistics, engineering or science applications.

The math environment, equation editor, and graph and table displays are provided as prototypes that can be used in other applications.

### **Newton Interconnect**

A major limiting factor in obtaining a thinner profile for MessagePad devices has been the DIN9 port used for serial and AppleTalk communications. In order to facilitate thinner devices, Apple has adopted a new standard connector for the Newton platform. The result is Newton Interconnect.

The connector is a JAE 26-pin connector which requires a JAE 26-pin custom plug. The height of the connector is much less than a DIN9. In addition to the serial/LocalTalk port, the pins allow access to power in/out, audio line-in and line-out and another serial input that has no

LTC Line Driver. There is also an auto docking pin that tells the unit it has been connected.

MessagePad 2000 will come bundled with a DIN9-to-Interconnect adapter, and eMate 300 includes both ports, so current cabling does not need to be replaced.

### **Value Series Flash**

Advances in technology have enabled much cheaper FLASH memory. This new technology, called "Value Series" FLASH allows RAM PC cards to be products for about half the cost of current cards. The Newton OS supports this type of memory. The eMate 300 hardware fully supports only the new type of card, though it will allow read only access to older (12V) memory cards. The MessagePad 2000 will read and write both (5V) Value Series and (12V) existing PC cards.

### **Serial Number Chip**

Both eMate 300 and MessagePad 2000 come with an on board serial number chip. Each device will have a unique serial number that can be accessed through a secure NewtonScript API. This provides developers with the ability to easily register or copy protect their software, or track individual units.

## **MessagePad 2000**

MessagePad 2000 is a major step forward in the evolution of the MessagePad product line. It is a cost-effective, powerful, easy-to-use handheld computer than can provide targeted solutions in both the horizontal and vertical markets.

MessagePad 2000 Provides:

- The fastest hand-held computer experience!
- More memory for applications and capturing data
- Long battery life
- Access to networks, Internet and Intranet sites
- PC (Mac and Windows) integration
- A wide base of developers with powerful development tools

### **MessagePad 2000 Markets**

For the horizontal market, MessagePad 2000 is a cost-effective handheld computer for highly mobile professionals. It combines a powerful processor, long battery life, instant on, general business applications, and connectivity to both the desktop and the Internet.

For vertical markets, MessagePad 2000 is the most extensible, mobile, and powerful hand-held computer for business enterprises seeking a cost effective solution to improve productivity, reduce costs and enhance the overall quality of service by capturing information at the point-of-activity.

Apple is focusing on the Home Health Care vertical market. We are working with SIs, VARs, and ISVs/IHVs to ensure that a whole product solution is available.

### **MessagePad 2000 Hardware**

The processor is a DEC StrongARM SA-110, which is a 32 bit RISC processor, running at 161.9MHz. The processor operates at 1.7 volts. The display is a 480x320 non-glare transreflective grayscale LCD display with an electroluminescent backlight, covered by a touch-sensitive tablet which is optimized for use with the pen. Part of the screen is used for a software button bar.

The unit has an 8MB ROM on a replaceable card, 1 MB of DRAM for system use, and 4 MB of Flash RAM for programs and data. There are two Type II PC card slots that support 3.3 or 5.5 volt operations at up to 500mA. There is also an internal serial connector that has access to three serial lines. The case has punchouts for an RJ-11 modem jack next to the interconnect port and another punchout for a ribbon cable along the cover hinge. There is also a small amount of room inside the unit for a modem or other serial card.

The unit has a front-mounted microphone, speaker, and an AC adapter and Newton Interconnect port along the top. The internal serial connector can be routed to the Interconnect port. Also along the top is the infrared transceiver. There will be an optional keyboard that plugs into the interconnect port.

The unit can run on 4 AA batteries or an optional NiMH rechargeable battery pack. Battery life is from 20 to 62 continuous hours of use depending on backlight and PC card power requirements. The NiMH batteries fast charge in about an hour.

MessagePad 2000 measures 8.25"L x 4.7"W x 1.25"H (210.3mm x 118.7mm x 27.5mm) and weighs only 1.8 lbs (0.82 kg).

### **Additional MessagePad 2000 Applications**

Available with MessagePad 2000 are a number of extra applications and services to provide a whole-product solution for our customers. Among these are:

- Newton Connection Utility for MacOS™ and Windows™



- NewtonWorks Word Processor (keyboard required)
- Newton Internet Enabler 1.1
- Web Browsing software
- Internet mail client software
- Spreadsheet software

## **eMate 300**

### **eMate 300 Market**

The eMate 300 has been designed in cooperation with educators to meet the specific needs of students. It works as a companion to MacOS and Windows-based PCs in a Distributed Learning Environment.

A Distributed Learning Environment is one that extends the reach of learning, and of computing technology, beyond the classroom to libraries, labs, homes, and the outdoors. The eMate 300's rugged, portable design and long battery life make it well suited for these situations. It's ideal for taking notes in a classroom or library, gathering data in the field, or getting on-line anywhere.

The Information Appliance Division plans to introduce eMate 300 in a variety of areas. Building on Apple's strong presence in education, the first products will be sold directly into the K-12 school system. Consumer and University products are expected to follow.

### **eMate 300 Hardware**

The eMate 300 uses a clamshell design which protects the case and keyboard when the unit is not in use. Thick plastics with reinforcing ribs, soft rounded corners, a steel chassis, and a shock mounted display provide protection against drops, twists and other abuses. Field replaceable components ensure minimal downtime if the inevitable occurs. The display, tablet, and backlight assembly, along with the keyboard and battery are all field replaceable, and the total weight with batteries is under four pounds.

The processor is an ARM 710a, which is a 32 bit RISC processor clocked at 25 MHz. The display is a half-VGA 480x320 transfective grayscale LCD display with an electroluminescent backlight. The display is covered by a touch sensitive tablet, optimized for use with the pen, and a 17mm sub-notebook keyboard is built in. The eMate 300 does not use screen space for a software button bar, instead using a groups of keys above the numbers on the keyboard as a

button bar replacement. There are keys for Extras, scrolling and overview, undo, find, and assist, and new keys have been added for docking, beaming, and closing slips.

The unit contains an 8 MB ROM on a replaceable card, 1 MB of DRAM for system use, and 2 MB of FLASH memory for programs and data. There is a single standard Type II/III PCMCIA card slot that supports 5V cards drawing up to 500mA, and an internal RAM/FLASH upgrade slot. The device is capable of using existing (12V) FLASH RAM cards in a read-only mode.

The four AA cell NiMH rechargeable battery pack provides about 28 hours of high usage between recharges, and fast-charges in about an hour. The battery space is designed to allow for a larger four A cell battery pack, which approximately doubles the capacity. There is a power adapter plug on the side in addition to charging contacts on the base, and the Newton Interconnect port can power the unit and charge the battery. A LED mounted on the rear indicates battery condition.

The unit automatically powers off when the lid is closed, and powers on instantly when the lid is opened. There are also power and backlight control keys on the keyboard. Sliders above the keyboard control the display contrast and the speaker/headphone volume.

A built in infrared transceiver is included that is compatible with existing Newton protocols and also supports IrDA at 115Kbps. A Newton Interconnect 26 pin connector is available as an alternative to a standard DIN9 serial/LocalTalk port. The unit contains a speaker and a headphone jack, in addition to audio line-out and line-in connections in the Newton Interconnect port.

### **Simplified Interface for eMate 300**

To simplify the Newton experience for students and ease configuration issues for teachers, a limited mode ("Simple" mode) is available on eMate 300. In Simple mode, the Newton filing interface is hidden, and the Extras drawer will show only a teacher-defined subset of the available applications. Third party applications can determine if the unit is in Simple or normal mode, and adjust their interfaces accordingly.

### **Multiple Users on eMate 300**

To allow multiple classes to easily share hardware, the eMate 300 now supports multiple users. This feature is available in Simple mode only. When enabled, the unit requests a name and optionally a

password when the unit is powered on. Once signed on, the user only works with their data; other users' data is hidden.

Teachers can predefine sets of users, or allow students to create their own accounts, or the unit can be configured to require a password. A special teacher password unlocks full access to the machine.

Applications must be updated to support multiple users. We recommend that applications store data for each user in a separate soup. Each application can find out the current user, and use the appropriate soup or otherwise adjust the visible data accordingly. Applications are notified when the user is changed or an account is deleted.

### **eMate 300 Classroom Connection**

To ease integration into a classroom environment, Apple is creating a specialized connection server intended to allow a classroom full of students to quickly retrieve their work at the beginning of class and move it back to the server at the end.

Unlike existing connection products, the server will support multiple connections at once. The user will connect via serial, IR, or LocalTalk and either upload the contents of the eMate 300 device to the server, or download data on a document-by-document basis.

On the server, each Works document will appear as a separate streamed object file. Developers may use desktop interfaces from Apple (part of the Desktop Integration Libraries or DILs) to read and write files in this format on the server. For example, XTND translators can be created to integrate these files with a variety of desktop applications. Translators for the built-in word processor and drawing applications will be included.

Data from Newton applications that are not integrated with Works will also be available on the desktop, in a slightly different file format. Each application soup will exist as a separate file on the desktop, and the same DILs interfaces can be used to read and write those files.

## **Conclusion**

The two new Apple-labeled products are nothing short of amazing. Besides the incredible handheld computing power and "gee whiz" appeal, they also deliver new capabilities for growth in markets where Newton devices are already present, and open up tremendous opportunities to expand into new markets like education and home health care. These new products in combination with the updated

Newton OS will provide a solid foundation for future growth of the Newton platform.

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Additional information about the Infrared Data Association can be found on-line at <<http://irda.org/>>.